

**FORECASTS AND TRENDS
FOR THE U.K. PROCESSING
SERVICES MARKET,
1980 - 1984**

INPUT EUROPE

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Prepared for:
MARS GROUP SERVICES

MARCH, 1980

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I. INTRODUCTION

I. INTRODUCTION

- This report has been commissioned by Mars Group Services (MGS). It represents the conclusion of phase 1 of a five phase project designed to assist MGS in its future plans for externally sold computer services.
- Phase 1 commenced on 28th February and this resulting report covers Forecasts and trends for the U.K. computer services market to 1984 inclusive. It begins with a profile of the market and five year forecasts and breaks down the market in a variety of ways. The next part of the report (Chapter IV) covers the Computer Bureau providers and Chapter V gives INPUT's scenario for the 1980's and sets out a number of selected market opportunities.
- The second phase of the project is to examine MGS's products and services together with in the third phase additional marketable resources required in the forecast period.
- The report has been compiled by Mr. J.N. Chapple and supervised by Mr. R.V. Nathan.

II. EXECUTIVE SUMMARY

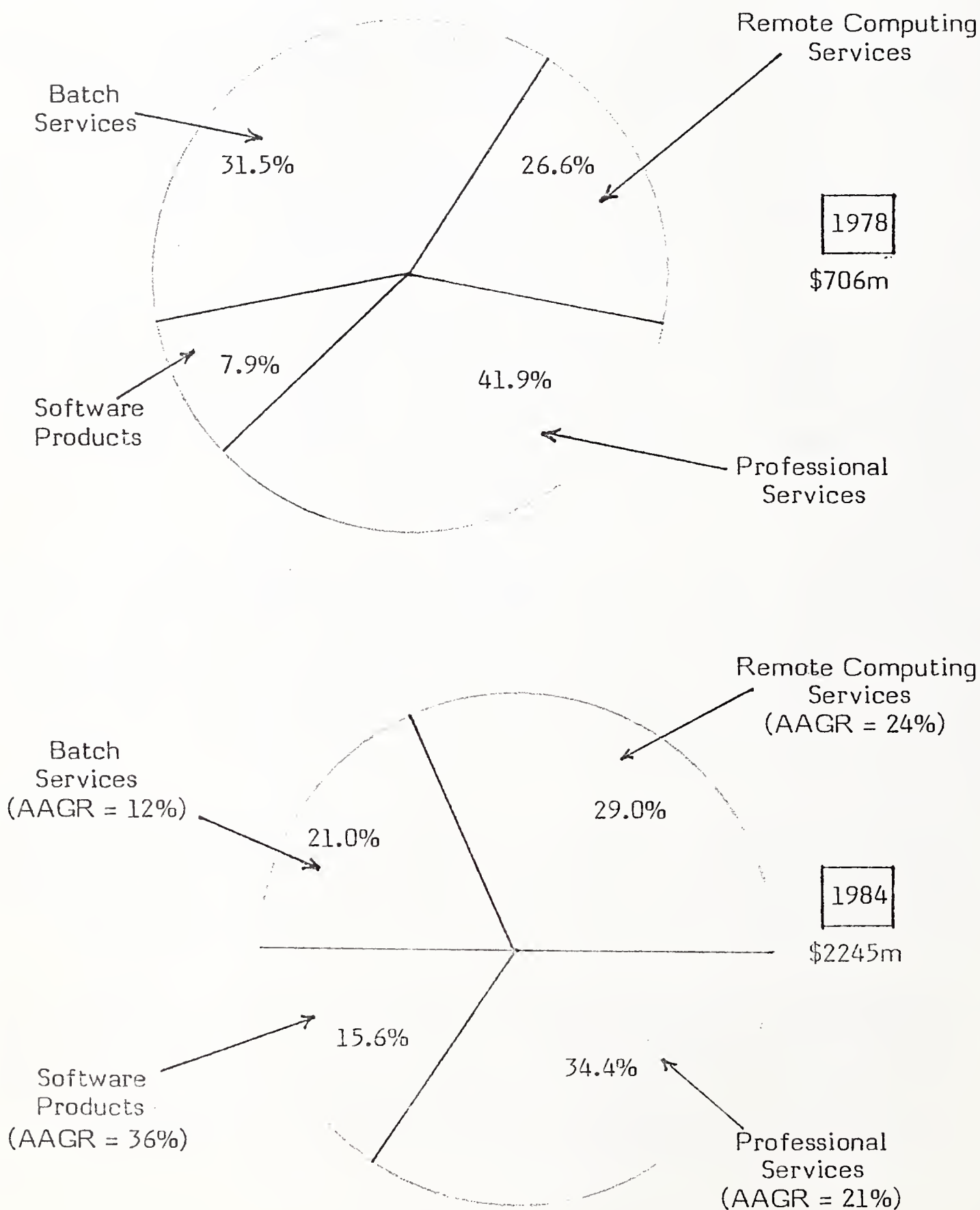
II. EXECUTIVE SUMMARY

A. THE MARKET IN PERSPECTIVE

- The West European market for computer services is expected to grow at an average annual rate of 19% from \$6.6 billion in 1979 to \$16 billion in 1984.
- By 1984, West Germany will have become the largest market for computer services with the U.K./Eire in third place after France.
- The market for computer services in the U.K./Eire is expected to grow from \$865m (£360m) in 1979 to \$2254m (£980m) in 1984, that is, to nearly three times its present value. The average annual growth rate is expected to be 21%. By 1984 the U.K./Eire computer services market will be just over one third of the size of the market in West Germany.
- Trends in the market are summarised overleaf in Exhibit II-A.1. They show that between 1978 and 1984 the main growth areas will be in software products and remote computing services. It also shows that although Batch processing services are declining in market importance, they will continue to account for a very large share of the market as a whole.
- Year by year forecasts are shown in Exhibit II-A.2. Changes in growth rates can be seen by reference to the growth rates for 1978/1979. The main changes are a slowing down in the growth rates for Batch and Professional services.
- Exhibit III-B.2 shows some 845,000 enterprises in the U.K. Of these, nearly 804,500 (95%) have sales turnovers of less than £5m per annum. It is among this group that the main bureau opportunities lie. 99% of these companies with a sales turnover of less than £5m lie in six main sectors as follows:

EXHIBIT II-A.1

U.K./EIRE COMPUTER SERVICES MARKET
THE CHANGING SCENE 1978 - 1984



Note: AAGR = Average Annual Growth Rate expected from 1980 to 1984.

EXHIBIT II-A.2

THE U.K./EIRE COMPUTER SERVICES MARKET
TRENDS AND FORECASTS BY TYPE OF SERVICE 1980 - 1984

TYPE OF SERVICE	MARKET TRENDS AND FORECASTS IN \$ MILLIONS										AAGR %
	1978	1979	78-79 %	1980	1981	1982	1983	1984*			
RCS PROCESSING	188	233	24	275	333	413	516	650		24	
BATCH SERVICES	223	260	17	300	347	395	435	479		12	
SOFTWARE PRODUCTS *	56	76	36	102	139	189	257	350		36	
PROFESSIONAL SERVICES	239	296	24	356	427	521	635	775		21	
ALL	706	865	23	1033	1246	1518	1843	2254		21	

NOTE:

1. '*' = CONSTANT 1979 DOLLARS
2. '+' = EXCLUDES MANUFACTURERS SOFTWARE

Sector	Number of Enterprises
Wholesale Retail	494,500
Transport/Communications	137,600
Manufacturers	71,000
Agriculture/Forestry/Fishing	34,950
Business/Services/Professions	34,600
Construction	25,900
	<hr/> 798,550 <hr/>

- It should be noted that two of the three major sources of bureau revenue - central government, banking and finance are excluded from the six sectors identified above.
- The computer services industry is extremely well developed in the U.K./Eire and is growing rapidly. Excluding computer manufacturers, there are some 1,000 services organisations of which 580 are judged to be genuinely active.

B. COMPUTER BUREAUX

- The distribution of computer services (see Exhibit III-B.3) shows that consultancy and software services are better represented in the midlands and northern counties than are bureau services. Bureau services organisations are relatively stronger in London and the south east.
- Bureaux revenues are analysed in Exhibit III-A.2, by industry sector. The major sources of revenue come from Manufacturing (23% including the Construction industry), Banking and Finance (14%) and Central Government (23%).

- IBM based bureaux dominate the bureau market for commercial data processing in central London, Wales and the West Country. They are relatively weak in the northern and southern counties. Bearing in mind the size of the Midlands industry, the penetration of bureaux in this area is low (see Exhibit IV-C.1).
- It is estimated that IBM and ICL based computer services companies, together have just under half of the computer services market.
- It is estimated that IBM based bureaux have 15% (only) of the Interactive timesharing market, 44% of the Remote Batch market and 23% of the Batch services market. ICL by comparison have a small share of both the Interactive and Remote Batch market but a higher share of the total market for Batch services.
- The top three bureaux ranked by overall RCS revenues are GEISCO, IBM and BOC.
- The top four IBM based bureaux are IBM, BOC, COMPOWER, and UCSL. Rankings of IBM based bureaux vary a good deal depending upon the criteria used. For example, ranking by total capacity places IBM as top of the league of IBM bureaux. But ranking by external sales places BOC top of the league at the moment. IBM is expected to move back into first place as the Warwick supercentre comes into its own.
- IBM itself is likely to become the largest bureau selling IBM based services when the new Warwick based supercentre is fully operational. A large proportion of its available capacity (the majority) is used by IBM staff working on projects for IBM or indirectly for customers. IBM's true external bureau sales are therefore not nearly as great as one might imagine.

C. MARKET OPPORTUNITIES FOR BUREAU SERVICES

- The computer bureau market still affords a number of good opportunities for providers of efficient IBM based services. Slough, the central Midlands, the north Midlands and southern England are all undersupplied with Bureau services.
- The establishment of the IBM supercentre in the Midlands need not be discouraging to a potential competitor. The market is large, IBM's sales effort will stimulate the local market and their services will be very expensive. Thus an efficient organisation should be able to take advantage of IBM's promotional activities and undercut them significantly on price.
- IBM's bureau services tend to be supported strongly by software specialists but not strongly by specialists with applications expertise. Their local Batch services tend to be best suited to experienced systems development personnel. They are usually not well suited to the novice computer user. The Midlands is therefore rated a good opportunity despite IBM's presence.
- Rapid growth in Interactive services means that opportunities exist for well supported system development aids and speciality time-sharing applications.
- Remote Batch services are a good opportunity area given a well chosen application and the right choice of terminal. The mail order sector represents an interesting opportunity of this type.
- Good batch services opportunities will exist in and around the Slough area. It is well populated with experienced computer specialists and it is also a densely populated area for light industry.
- There is a good number of extant smaller IBM mainframe based bureaux with obsolete equipment. Opportunities exist for selling them a package deal of wholesale time, a good RJE terminal and good messenger services (for magnetic tape transporting, certain types of printed reports and input documents (OCR, cards etc)). The attraction of this type of service is its low added value profile.

- Specialist databank information opportunities exist for both data and text. A number of embryo databanks exist and scope exists to develop many more. Databanks are expensive to keep up-to-date. This problem provides a potential trap for the unwary.
- Vertical market opportunities have been systematically identified by computer marketers. A list of many of these appears in Chapter V. Most of them are being aggressively sold to by the vendors of micro and minicomputers. One very large vertical market that has not been significantly penetrated is the construction industry with its contract costing requirements. This sector has been slow to automate, but is a good opportunity.
- Manufacturing is one of the largest market opportunities. However to provide good service requires a heavy commitment of skilled applications staff since systems work in the manufacturing sector is more labour intensive than in most others.

D. OTHER MARKET OPPORTUNITIES

- Computer Education and Training is one of the fastest growth markets and a good opportunity area. It is also critically dependent upon the skills of key personnel. Regular use of freelance training specialists with expertise in selected subjects tends to be the way most companies work. In-company courses are invariably less profitable than external courses.
- Good market opportunities exist for Turnkey systems designed to be complementary to a Bureau service. They also provide Bureaux with a means of underpinning its market base of business. Without a turnkey distributed system option for its customers, a Bureau's customer base will always be vulnerable to the microcomputer and minicomputer vendors. Further, the huge predicted growth in the market for software products presents a prime opportunity given the right choice of vertical markets. The trend towards distributed on-site hardware under direct user control must be exploited rather than resisted by bureau operators. This philosophy fits in well with that of successful operators such as ADP.

- There is a market for speciality technical support to back the sale of Interactive services. Financial Modelling is a good example of an application which needs the user to develop his applications aided by a specialist in the use of the financial modelling tool to be used.
- The development of custom tailored applications using system generators will be a big growth area, but not one which fits well with a computer bureau business based on IBM equipment.
- About 30% of the 22m telephone subscribers are within reach of the Prestel system and at present there are 2,400 subscribers. The Post Office is expected to invest £100m in Prestel development and £10m has been allocated for expenditure in 1981. Future work will include the development of an international service. By the late 1980's Prestel will allow colour pictures as well as digitised graphics, but this will require replacement of existing sets. Such a service is seen as essential for activities such as catalogue type selling by Prestel. Prestel could be a useful adjunct to a databank service (see above).

III. THE U.K./EIRE MARKET FOR COMPUTER SERVICES

III. THE U.K./EIRE MARKET FOR COMPUTER SERVICES

A. THE MARKET IN A EUROPEAN CONTEXT

- The computer services market in Western Europe in 1978 was \$5.4 billion and is forecast to have grown 21% in 1979 to \$6.6 billion in current dollars.
 - This excludes IBM software and services revenues sold through DCS and RCS Departments of \$0.27 billion.
 - It also excludes captive revenues of \$0.8 billion and export revenues of European companies of \$0.15 billion.

Note:

Captive revenue is defined as services sold to the major shareholders of a bureau. Export revenue comes from external customers.

- The U.K./Eire rank third largest throughout the period 1978 - 1984 in the league table of the European computer services market.
- For Western Europe as a whole during the five-year forecast period from 1979 through 1984, the average annual growth rate (AAGR) is 19% with the market growing to \$16 billion by 1984.
- Of considerable significance are the wide differences in growth rates within certain segments of the total market.
 - For processing services, general business and industry specialty delivered in an RCS mode will grow at 26%, while scientific and engineering delivered in a batch mode will grow at 6%; other combinations of types and modes of services will have intermediate growth values to yield the key overall market figures shown in Exhibit III-A.1.

EXHIBIT III-A.1

WEST EUROPEAN COMPUTER SERVICES MARKET FORECAST, 1979 - 1983

COUNTRY	1979 (\$ MILLIONS)										1984 (\$ MILLIONS) ***										AVERAGE ANNUAL GROWTH RATE 1979 - 1984			
	RCS	Batch	S/W Prod.	Prof. Serv.*	Total	RCS	Batch	S/W Prod.	Prof. Serv.*	Total	RCS	Batch	S/W Prod.	Prof. Serv.*	Total	RCS	Batch	S/W Prod.	Prof. Serv.*	Total				
FRANCE	\$ 350	\$ 801	\$ 85	\$ 334	\$1570	\$ 953	\$1593	\$ 237	\$ 926	\$ 3703	22%	13%	24%	23%	19%									
GERMANY	217	636	79	254	1186	587	1529	294	615	6036	22	17	30	19	21									
UK/EIRE	233	260	76	296	865	650	479	350	775	2254	24	12	36	21	21									
ITALY	77	350	61	186	674	201	607	176	549	1526	22	12	24	24	18									
SWEDEN	109	229	12	125	475	294	386	44	311	1032	22	11	30	20	17									
NETHERLANDS	108	192	26	116	442	265	382	91	306	1044	20	11	28	21	19									
DENMARK	55	149	14	89	307	131	240	49	260	674	19	10	28	24	17									
BELGIUM/LUX.	84	101	11	77	273	234	173	31	218	652	20	10	23	23	19									
OTHERS +	196	346	59	200	801	626	827	186	526	2165	26	19	26	21	22									
WESTERN EUR.	1429	3064	423	1677	6593	3920	6233	1457	4479	16062	22	13	28	22	19									

* Turnkey Systems included

+ 1983 dollars are expressed as "Constant", 1984 Dollars. "Current" 1983 dollars will be higher or lower depending on the actual inflation rates, and exchange rate fluctuations.

+ OTHERS are: Switzerland, Spain, Norway, Finland, Austria, Portugal, Greece and Iceland.

- Industry sector markets, vary widely in relative size.
- Central Government and Manufacturing are the largest industry markets, as shown in Exhibit III-A.2. (A comparison for each sector between Europe and the U.K./Eire is given as Exhibit III-B.6).
- Banking and Finance is a major market, which has not grown recently as fast as it did in the past due to the increasing pull of services in-house.
- Transportation and education are the lagging sectors, with the remaining eight sectors forming a middle group.

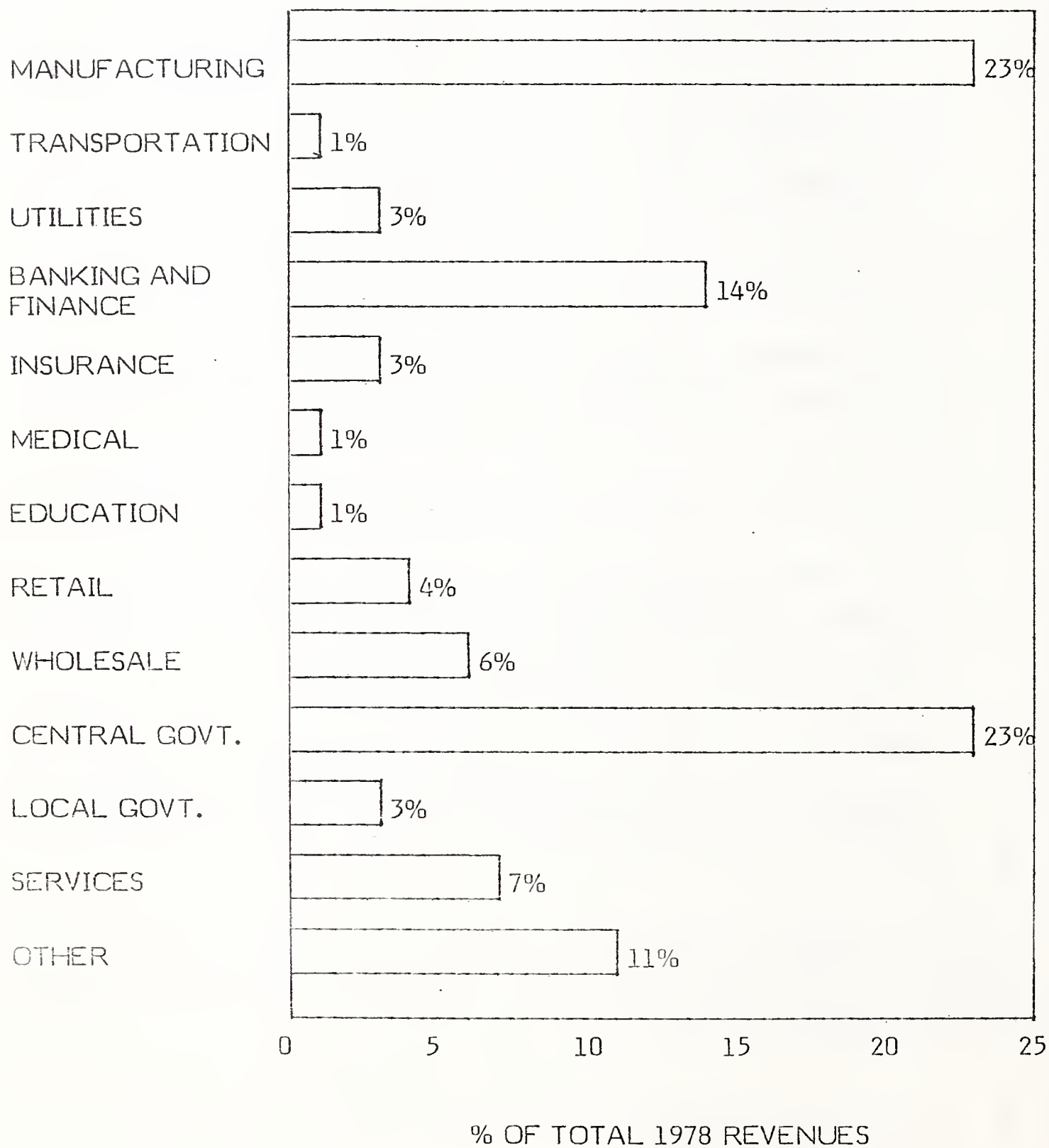
Software products are forecast to grow at 28%, driven by several forces:

- The increasing willingness of EDP managers to use packaged software as a partial solution to a growing applications backlog.
- The profusion of small computers, and now even personal computers.
- The continued investment by U.S. software companies in research and development and the tendency to market their products directly in Europe rather than through agency agreements.
- The emergence of DBMS, report generators and related implementation language products in competition with the purely procedural languages COBOL, BASIC and ASSEMBLER.

A more aggressive switch to selling software unbundled, by IBM and other hardware vendors, would cause actual market growth to exceed considerably, the forecasts given.

EXHIBIT III-A.2

EUROPEAN BUREAU REVENUES ANALYSED BY INDUSTRY SECTOR



- Continued growth of professional services at a high rate (22% AAGR) is forecast. There are indications that this growth will be on an accelerating curve as users turn to outside consulting, programming and systems analysis to assist in implementation of more complex communications-based or industry specialty systems. Consultancy and training are growing particularly strongly as the nature and complexity of the environment changes. This sector is currently responsible for many small company start-ups as entrepreneurs detect market opportunities.
- One of the most significant factors in the growth of professional services in particular, and computer services in general, is the continuing shortage of skilled EDP personnel. Two traditional sources of staff, central government and computer manufacturers, are still providing a number of trained people but not in the quantity that flowed into the computer services industry five years ago. The flow of inexperienced graduate personnel is now the main source of new entrants to the European industry.
- The U.K. is among the higher frequency users of external services in Western Europe - excepting, that is, the extreme usage figures found in Sweden and Norway. The U.K. is on a par with France and Holland; the figures are as follows:

France	41%
U.K.	43%
Holland	44%
Sweden/Norway	72%

B. MARKET SHAPE

- Exhibit III-B.1 gives recent values for basic economic indicators for the U.K. The Gross Domestic Product grew at 12.3% during 1977-1978 which compares with a growth of 31% (in the same period) for the computer services sector of the market.

EXHIBIT III-B.1

BASIC ECONOMIC STATISTICS
UNITED KINGDOM

<u>INDICATOR</u>	<u>YEAR</u>	
	<u>1977</u>	<u>1978</u>
GDP + £B	113	127
GDP + \$B**	198	249
Population (millions)		
- Total	56.05	56.09
- Total Working	25.03	25.08
Agriculture, etc.	0.68	0.66
Manufacturing	9.56	9.34
Service Industries	14.80	15.08
No. of organisations *	-	844,800
(thousands)		
No. of establishments *	-	1,400,000
(thousands)		

+ At market prices

** At current exchange rates

* These figures include the numbers engaged in agriculture, forestry and fishing, but exclude businesses run from home premises.

SOURCES: COI and INPUT estimates

- Exhibit III-B.2 gives a detailed analysis by size and type of the 844,800 enterprises identified in Exhibit III-A.1. It is most relevant that 95% of all enterprises listed have sales turnover's of under £5m per annum. It is among this group that the external market for commercial data processing/and bureau services applications predominantly resides.
- The U.K./Eire computing services market is extremely well developed and growing rapidly. The total market size in 1979 is estimated at \$865m (£360m) and is forecast to grow threefold in value at an average annual growth rate of 21%, to a value of \$2254m (£940m) in 1984.
- Within the overall growth of the market there will be some significant shifts of emphasis. The outstandingly significant item is the projected growth in the market for software products from \$76m (£31.6m) in 1979 to \$349m (£145m) in 1984, that is to nearly five "times" its present value or two and a half times its present size in real growth terms (i.e., after taking inflation into account).
- Remote computing services will grow at the expense of batch processing services. In 1978, batch services accounted for 31% of the computer services market and 54% of bureau work whereas in 1984, batch processing is expected to account for only 21% of the overall market and 42% of bureau work. Thus batch processing will still account for a substantial slice of bureau sales in 1984 even though its significance is decreasing.
- A 1977 analysis of the largest U.K. companies showed that there is still a large number of important organizations spending upwards of \$20,000 per month on external bureau services, who are prepared to switch to a competitive service, providing guarantees of reliability are offered and the new service economically justified.
- The computer services industry in the U.K. is composed of over 580 active companies. Over 900 are known to the National Computer Centre (NCC) to have existed at one time or another over the last five years; many have merged or been acquired and appear under different names today.

EXHIBIT III-B.2

DISTRIBUTION OF ENTERPRISES BY SIZE AND INDUSTRY
UNITED KINGDOM

ISIC Code	Industry	Enterprise by Size of Annual Turnover (£)			
		5.0M	5.0 - 50M	50M	Total
11 - 13	Agriculture/Forestry/ Fishing,	34,950	14,750	300	50,000
21 - 29	Mining/Quarrying	1,500	440	60	2,000
31 - 39	Manufacturing	71,000	7,500	1,500	80,000
41	Electricity/Gas etc.	1,700	250	50	2,000
50	Construction	25,900	2,000	100	28,000
61 - 63	Wholesale/Retail	494,455	5,500	45	500,000
71 - 72	Transport/Communications	137,620	2,500	80	140,200
81	Financial	940	340	120	1,400
82	Insurance	290	360	50	700
83	Business Services/ Professions	34,600	2,890	10	37,500
91	Government	1,500	1,450	50	3,000
	TOTAL	804,455	37,980	2,365	844,800

- A large proportion of the remainder have gone out of business, showing the U.K. market now presenting the profile of a market that has achieved a measure of consolidation and maturity. With this maturity has come a period of growth in RCS, where the impact of vendor pressure as a factor in market expansion is clearly visible.
- The industry in Eire supports only 38 firms.
- The vast majority of computer services vendors (69%) are privately owned. None are quoted on the stock exchange. A similar majority of vendors are concentrated in London and the South East (see Exhibit III-B.3).
- In the last five years, the number of spin offs (or organizations which set up their EDP departments as separate entities offering computer services) has increased. As partial reflection of this trend in 1978 75% of the U.K. computer services revenue comes from the private sector, whereas only 17% comes from the public sector (5% from Central Government) and 8% from clients based outside the U.K.
- Exhibits III-B.4 and III-B.5 show the results of surveys into users of varying size of company and spending in each main service category. The best market for each type of service is:

Batch	-	Small companies spending less than £1,000 per annum externally,
Remote Batch	-	Medium sized companies spending between £1,000 and £5,000 per annum externally,
Interactive	-	Medium sized companies spending between £1,000 and £5,000 per annum externally.

EXHIBIT III-B.3

GEOGRAPHICAL DISPERSION OF COMPUTER SERVICES

LOCATION	SERVICE CATEGORY (%)	
	PROCESSING	CONSULTANCY AND SOFTWARE
<u>ENGLAND</u>		
- NORTH	8%	17%
- EAST	1	2
- MIDLANDS	11	17
- SOUTHWEST	2	5
S.E. AND LONDON	67	54
<u>SCOTLAND</u>	7	3
<u>IRELAND</u>	3	1
<u>WALES</u>	1	1
TOTAL	100%	100%

SOURCE: COMPUTER USER'S YEARBOOK 1979

EXHIBIT III-B.4

GROWTH TRENDS BY SERVICE TYPE AND SIZE OF USER SPEND

SERVICE	EXTERNAL EXPENDITURE RANGE (£ Sterling)					OVERALL
	1K	1K-5K	5K-12K	12K-25K	> 25K	
Batch	+ 12%	+ 3%	- 10%	- 16%	+ 2%	- 4.0%
Rem. Batch	+ 2%	+ 33%	+ 7%	+ 3%	+ 1%	+ 4.0%
Interactive	+ 15%	+ 21%	+ 4%	+ 10%	6%	+ 12.3%
On Site	N/A	N/A	N/A	N/A	N/A	

Note:

The percentages under specific expenditure ranges are simple averages of respondent estimates; the "Overall" figures are weighted averages according to expenditure range.

EXHIBIT III-B.5

GROWTH TRENDS BY SERVICE TYPE AND SIZE OF USER COMPANY

COMPANY SIZE	BATCH	REM. BATCH	INTERACTIVE	ON SITE
Large	- 4%	+ 4%	+ 12%	N/A
Medium *	+ 10%	+ 13%	+ 25%	N/A
Small *	+ 20%	+ 7%	+ 15%	N/A
OVERALL	+ 17%	+ 9%	+ 25%	N/A

Note: * These figures are INPUT estimates.

- Expected trends in service requirements show a strong leaning towards interactive services. However this trend must be viewed in the context of a much smaller population of remote batch users but a larger spend per remote batch user. Growth of interactive services has been held back by the relatively poor software that has been available from both ICL and IBM, the dominant vendors of computers to the bureaux in the U.K. Not only has software from IBM and ICL been uncompetitive, but IBM based services were typically expensive by comparison with those of say ADP, GEISCO and COMSHARE during the early market growth period (the late sixties).
- Exhibit III-B.6 shows a comparison of bureau usage between U.K./Eire and U.S.A. The main differences are the much greater significance in the U.K. of the manufacturing sector as a bureau user and the much greater significance in the U.S.A. of the Banking and Finance sector.
- It appears from Exhibit III-B.6 that cross industry applications (e.g., general accounting packages) mounted on bureau services are more important in the U.K., than in the U.S.A., conversely, vertical market specialities (e.g., Banking, Finance, Insurance) are more significant in the U.S.A. This is what one would expect in a country where the vertical markets are so much bigger
- The manufacturing sector in the U.K. taken together with the construction industry accounts for one third of the bureau business (see Exhibit III-B.6). It is important to be aware of wide variations in the geographical concentration of business in different manufacturing sectors as Exhibit III-B.7 shows. More than 50% of the Instrumentation and Electrical Engineering sectors are located in the Southern regions, whereas vehicle and mechanical engineering sectors are more evenly spread between Southern, Midland and Northern regions.

EXHIBIT III-B.6

BUREAU REVENUES ANALYSED BY
INDUSTRY SECTOR

SECTOR	U.K./EIRE %	U.S.A. %
MANUFACTURING	25	14
CONSTRUCTION	8	
TRANSPORTATION	2	1
UTILITIES	3	3
BANKING & FINANCE	10	19
INSURANCE	3	6
MEDICAL	1	3
EDUCATION	2	1
RETAIL	5	5
WHOLESALE	8	3
CENTRAL (& FEDERAL) GOV'T	20	25
LOCAL (& STATE) GOV'T	3	6
SERVICES	3	3
OTHER	7	12
TOTAL	100	100

Note:

U.K./Eire figures are INPUT estimates. U.S.A. figures are based on ADAPSO survey covering 43% of U.S. Market for computer bureau services.

GEOGRAPHIC DISTRIBUTION OF THE ENGINEERING SECTORS

	Mech. Eng.		Instrumenting		Elec. Eng		Vehicles		Total	
	No. Est.	%	No. Est.	%	No. Est.	%	No. Est.	%	No. Est.	%
England										
North	296		26		105		38		465	4.3
Yorkshire & Humberside	637		47		123		141		948	8.8
North West	734		77		232		199		1,272	11.8
Northern Regions	1,697	29.2	150	16.1	460	18.7	378	23.7	2,685	24.9
West Midlands *	822		58		251		343		1,474	13.7*
East Midlands	472		39		147		132		790	3.3
East Anglia	184		35		84		46		349	3.2
Midland Regions	1,478	25.5	132	14.2	482	11.6	521	32.7	2,613	24.2
South East *	1,528		477		1,087		439		3,531	32.7*
South West	397		83		165		108		753	7.0
Southern Regions	1,925	33.2	560	60.3	1,252	50.8	547	34.3	4,284	39.7
Wales	211		27		103		74		415	3.8
Scotland	425		53		144		54		676	6.3
Northern Ireland	70		7		25		21		123	1.1
Totals	5,806	100	929	100.0	2,466	100.0	1,595	100.0	10,796	100

Note:

* Survey Regions

Companies with under 20 employees are excluded.

C. BATCH SERVICES

- Batch Services continue to be a popular service in the Industrial group of companies examined (Times Top 1000). This is however not true of the Financial companies included in a recent INPUT survey.
- The stability of the user base is questionable in some key sectors of the market (British Banks Overseas, Foreign Banks, Insurance companies, Clearing Banks, Building Societies, Finance Houses, Discount Houses) but also in the lower half of the Times Top 1000. In this last category the percentage of respondents expecting a decline in expenditure is high (14%). In terms of a quantified rate of decline users in large organisations anticipate a 4% decline (see Exhibit III-B.4).
- Batch companies will realise the market growth potential forecast (see Exhibit III-B.5) by concentrating on small and medium sized organisations. In this market arena there is however a strong conflict between in-house minis and traditional Batch Services.
- The Batch Services market is gradually losing its clients to in-house computers (frequently turnkey minicomputers) but has not lost a great deal to Remote Batch Services as yet. Remote Batch Service providers are better able to counter the aggressive sales tactics of minicomputer vendors and OEM's than are Batch Service providers.
- The Batch Services market is fragmented into many small territories. Without an external source of investment these vendors cannot grow substantially. Their territories are limited, as are their abilities to fund new product development more cost effective computers and marketing force expansion.

D. REMOTE BATCH SERVICES

- In the markets examined by recent surveys, the penetration of Remote Batch Services was small indeed. Only 86 single-and multiple-source users were found. The poor penetration achieved has been due, not to the nature of the type of service (it is an implicit feature of most interactive services anyway), but due to the high threshold cost of obtaining a suitable terminal.
- The massive support of Centre-file by the Building Society group distorts the picture from a vendor market share standpoint, and it would be erroneous to extrapolate this data to other, wider markets.
- The ideal application for the traditional punched card based RBT (Remote Batch Terminal) has been where fast turnaround, fairly high print volume, moderate data input and remoteness from a computer have been the primary job characteristics. Groups of six to twelve programmers needing facilities for developing large commercial and scientific programs but with no in-house computer at hand, typically have these service requirements. In addition, these scientific programmers also have a need to run their programs on an RBT basis, once developed. This is not necessarily the case with commercial programmers, but in general they are not responsible for running programs once developed.
- In the commercial applications area, the traditional card based RBT services are falling from favour for the same reason as conventional Batch services. People now want fast turnaround data entry and correction, but they do not want to incur post office line costs during data entry and validation. They want to avoid as much as possible of the multiple handling and batch control costs implicit in off line Batch Processing, and avoid also the long "elapsed time tail" implicit in multiple pass data re-cycling on an inflexibly scheduled mainframe computer.

- The cost of a card based RBT is now at least double that of an 8 bit microcomputer configured to operate as an RBT without card capability but with the important addition of store and forward capability. But adequate software is only just becoming available to make such RBT's a viable proposition. The alternatives available from such vendors as Ventek and Mohawk are good but greatly overpriced for the market that needs them. The user acceptable price range for a single video RBT (inclusive of floppy disc or tape cartridge storage) is £3,500 to £6,500. At the bottom end of the range, the RBT would be exclusive of a printer since in a two terminal RBT environment, only one printer is necessary in many situations.
- Exhibit III-D.1 shows the results of a recent survey of selected industry sectors into the relative usage of Batch, Remote Batch and Interactive services. It should be noted that remote batch usage has only been significant in sectors making substantial use of both batch and interactive services. Typically such users are experienced purchasers of external services.
- Users of Remote Batch Services have less of a tendency towards a decline of usage than Interactive and Batch users and a higher percentage of stable users. Large organisations will show a 4% increase in demand for Remote Batch services over the next 2 years. (See Exhibit III-B.4). Better growth will be found in medium-sized companies which have large enough data volumes to justify a Remote Batch service but insufficient justification for heavy internal computer processing capability; this will apply to a lower extent to demand in the small companies sector. (See Exhibit III-B.5).
- Individual expenditure trends show a remarkably heterogeneous picture:
 - the Accepting Houses, Mining and other Finance group evidences a lack of interest in Remote Batch services.
 - similarly, the Insurance sector as a Remote Batch market is in a state of flux with an equal number of users with a tendency towards growth as with a tendency towards a decline in usage.
 - all other sectors are growth markets, the best of which is the Times Top 50. The Times 51-200 is also a good growth market.

EXHIBIT III-D.1LARGE ORGANISATIONS' PROCESSING SERVICES USAGE BY INDUSTRYUNITED KINGDOM

ISIC	INDUSTRY	RESP % 'GE	EXTERNAL SERVICES USAGE				IN HOUSE USAGE %
			ALL	B	RB	I	
11 - 13	Agriculture/Fishing	100	50	50	0	50	100
21 - 29	Mining/Quarrying	-	-	-	-	-	-
31	Food/Drink/Tobacco	45	41	22	11	22	93
32	Textiles/Clothing	42	63	63	0	13	75
33	Wood Products	20	100	100	0	0	0
34	Paper/Print/Publ.	32	0	0	0	0	89
35	Chem./Petrol/Coal	30	42	42	8	17	75
36	Non-Metallic Prod.	10	0	0	0	0	100
37	Basic Metal	70	57	14	14	29	71
38 - 39	Fabricated Metal Prod.	37	38	14	14	38	81
41	Electricity/Gas	24	83	50	33	33	67
50	Construction	64	61	33	22	33	39
61 - 63	Wholesale/Retail	45	38	31	0	23	85
71 - 72	Transport/Comm.	40	25	25	0	0	100
81	Financial/Banks	46	50	42	0	17	92
82	Insurance	35	20	20	0	10	100
83	Business Services	70	43	43	14	29	29
91	Government	20	80	40	60	10	40
OVERALL WEIGHTED AVERAGE		40	44	28	10	20	76

- The significance of the last point is that the Remote Batch services opportunities lie, with the exception of the Clearing Bank/Building Society/Finance and Discount Houses (very much the province of Centre-file at present) in those markets where Interactive service vendors are strong and Batch service vendors are weak.
- It is more likely that the Remote Batch market will be captured by Interactive vendors than by Batch vendors extending their coverage to a larger client base than at present. They are better attuned to the provision of good on-site services than are batch vendors.
- None of the major services vendors (IBM, UCC, GEISCO, COMSHARE) have established themselves strongly as Remote Batch providers in the company groups examined. The market is therefore wide open to a determined thrust by vendors who identify packaged applications which need package intelligent on-site RBT's with remote mainframe power and database management applications.

E. INTERACTIVE TIMESHARING SERVICES

- The contrast in usage of Interactive services with usage of Batch and RB services is striking; it is the most heavily used external service. The distribution of the expenditure is also clearly established between the major vendors.
- The market for Interactive (Timesharing) services in the company groups examined shows strong growth in the Times Top 500. Growth is also good in the Times 501-1000, British Banks Overseas and Foreign Banks. In all markets, with the exception of the Times Top 500, the user base is in a state of flux with a substantial proportion planning to decrease their usage of Interactive Services.

- This "de-emphasis" on Interactive Services is most apparent in the Insurances and Accounting/Management Consultancy sectors where planned declines reached 31% and 38% respectively of respondents. Thus mainstream commercial data processing is not a good product opportunity for Interactive services.
- The Interactive Services growth in the U.K. reached 29% per annum in 1977, a rate, which cannot be sustained by the increased usage of Interactive services by current users, (who account for nearly half of this growth). Thus, new users must be sought by the major vendors to keep pace with (or exceed) the rate of market growth so as to sustain or increase current market shares.
- The large user organisations sampled expect a 12% growth in their future requirements for Interactive Services. (See Exhibit III-B.4). (Note that growth from new users is not included in this figure).
- Highest growth in the usage of Interactive services will continue to be found in large organisations; only modest growth is likely to be achieved among the small organisations. (See Exhibit III-B.5).
- Good growth is occurring among a number of specialist bureaux providing information retrieval services. Such bureaux include stocks and shares, medical and library abstracts.
- Most bureaux classed as 'Interactive' also provide remote batch capabilities initiated through the command language of the interactive services accessed through interactive terminals. These services are nevertheless primarily interactive. The principle difference between the Remote Batch service achievable from an Interactive provider and from a Remote Batch provider lies not so much in the provider's service but the terminal equipment used. Interactive service providers are supporting few terminals with store and forward capability or fast printers. They are supporting even fewer terminals which are user programmable. Remote Batch service providers are increasingly supporting such terminal equipment because it is becoming more price competitive with the alternatives.

F. SOFTWARE PRODUCTS

- The world market for "independent software products" - computer programs sold by organisations other than computer manufacturers is worth over £1,000M a year and growing at 25 per cent annually. This category covers both systems and applications software other than that sold on a turnkey basis as part of a total offering of hardware and software.
- The real size of the software products market however is in reality much larger than the foregoing paragraph indicates because much of the software supplied by manufacturers is 'bundled' into the price for their hardware. During the 80's, unbundling is likely to increase a great deal and this may necessitate a re-definition of the software products category to include manufacturers' software.
- Excluding manufacture and turnkey supplied software, the total West European market for software products was \$423m in 1979, of which \$76m is attributable to the U.K./Eire. This puts the U.K. as third in the league of independent European software producers after France and Germany. However, by 1984, the U.K./Eire is expected to be in first place as a software producer. The U.K./Eire is showing the fastest growth rate in Europe at an average 36% a year during the period 1979 - 1984. Germany is growing faster than France and is expected to overtake French produced software. If software unbundling spreads rapidly in Europe, the significance of Siemens in Germany and ICL in the U.K. will be greater than CII in France, thus, the U.K. will still come out ahead of the other European countries.
- The market for software products can usefully be classified as follows:
 - Horizontal Industry Applications,
 - Vertical Industry Applications,
 - Machine Dependent Systems Software,
 - Systems Generators,
 - Hardware Independent Systems Software.

- Horizontal or cross industry applications products such as general payroll, sales, purchase and nominal ledger accounting applications have enjoyed and continue to take a large share of the European market.
- Resistance to the use of packages is declining. In the U.S.A., the size of each vertical market is so much larger than it is in each European country that there is more U.S.A. emphasis on vertical market specialist applications products.
- Key vertical market applications such as hotel reservations and accounts, insurance broking, building societies, stock broking, estate agents and solicitors are all the subject of considerable activity by minicomputer manufacturers and software houses specialising in minicomputers and microcomputers.
- Machine dependent systems software was the main growth sector during the seventies, with IBM 370 series computer users being the dominant target market for vendors of utility software, database handlers, project management and tools and various programmer productivity aids. The emphasis on this area is expected to decline as IBM supplied products improve in quality and variety.
- Machine independent software is almost entirely restricted to Intel 8080 and Zilog Z80 microprocessor based computers. This is because both chips support a largely common instruction set which forms the basis of the independently written CP/M operating system (by Digital Research) and several BASIC interpreters designed for use with CP/M by such suppliers as Microsoft. In concept, CP/M is very similar to and based upon the DEC's RT 11 Operating System for the smaller PDP 11 computers (64K memories or below). These software tools and CAP's Microcobol have made it possible to develop the first really machine independent application programs and packages.
- Application development aids are proliferating. Many of these are fairly conventional report generators (e.g., Easytrieve) or language mutations (e.g., PL/1 and PASCAL). Not to be confused with such productivity aids is a newly emergent category of software, the "System Generator" (see Section III-J).

G. PROFESSIONAL SERVICES

- This category covers:
 - Education and Training,
 - Consultancy,
 - Tailor Made Software,
 - Contract Programming,
 - Turnkey Systems.
- The fastest growth segment of the professional services sector in the seventies has been education and training.
- Other segments are growing at about the same rate as each other. The demand for contract programming is strong in the mainframe sector and for turnkey systems in the minicomputer area. Tailor made systems continue to be in great demand in larger companies.
- The reducing value of hardware in small business systems and the low OEM discounts given on microcomputers (rarely more than 23% and typically nearer to 15%) means that OEM supplier profit margins are being eroded at the bottom end of the market. Many users are running into serious problems after buying microcomputers and packages with little or no implementation support or post implementation software maintenance cover. In this market area, user budgets will only stand the cost of independent professional services when a large number of microcomputers are required for one application type in multiple locations.
- Competitive pressure from microcomputer distributors has resulted in a considerable fall in the average price of applications software. These products, especially at the low end of the market (PET's, Apple's etc.), have been regarded with scepticism by many people since the early offerings were so inadequate. However, accounting packages for microcomputers have improved a great deal in the last year and the PET in particular is now being aimed more at small business than the hobbyist.

- The strongest market for consulting continues to be among the large main-frame installations in which the organisation, personnel and technical problems are at their most difficult and where the budgets for external support can be considerable.
- Not only are software houses continuing to proliferate, but some have now become very large with in excess of 500 employees each (Hoskyns, Logica, CAP etc).
- There is a trend towards a market stratification at the bottom end of the market where microcomputers are being sold with packages by specialist OEM's. Organisations such as Curry's and Dixons - the big chains - will be able to distribute microcomputers at prices which the small OEM's will be unable to match. These big chain distributors will need area based software and implementation support for their customers but they will not take on responsibility for the quality of software supplied by these software houses. The big chains will therefore have to act as brokers or agents for software houses, many of which will be very small. In the second half of the 80's, the small software houses are likely to form themselves into groups with common interests (such as use of same operating systems, same compilers, same system generators etc).

H. VEHICLES FOR COMPUTER BUREAUX

- Many bureaux see their services in terms of their added value component and the "vehicle" type through which their machine time is sold. For example Hoskyns use specialised manufacturing industry packages as a vehicle to sell bureau time. They aim to be a high value added service provider which means a labour intensive and specialist support organisation to back-up its bureau activities. Conversely, Teamco is a low added value services provider since it wholesales its machine time. It has persuaded a number of small bureaux to replace their obsolete IBM equipment with RBT's. Given wholesale prices for time, this has enabled Teamco to find a market niche without having to set up expensive technical support groups.

J. IMPACT OF NEW TECHNOLOGY

Packet Switching

- From a bureau viewpoint, the advent of packet switching services ought to give a strong incentive to the timesharing operators. Unfortunately for some (e.g., GEISCO), investment in existing communications hardware may prevent them taking advantage of packet switching for some time. For low volume geographically remote user applications, packet switching will pave the way for business which previously would not have been impossible due to prohibitive post office circuit charges. Packet switching will be attractive for inter-European services.

Prestel

- Prestel is one of a number of services known collectively as Viewdata. Prestel is in the process of being re-organised, and will become part of the Post Office's new Business Systems Department, operating under the Telecommunications Marketing Executive.
- So far Prestel has had negligible impact on the business or domestic community of prospective users despite the tremendous amount of publicity and market research that has been given to it. The big question is whether with the thrust of marketing effort behind it, it will become a major new information service.
- Prestel is seen by the community at large as a Post Office information service, and information providers are at present collaborating, more because they do not want to miss out on a possible opportunity, than because they believe it will be a success.
- From the point of view of a bureau, the most interesting feature of Viewdata technology is that any bureau can develop a Viewdata (and therefore Prestel) compatible service.

- Anyone with a Viewdata TV set will be able to dial up Prestel or any other service with the right interface software. For example, a holiday tour operator could establish a Viewdata compatible service enabling anyone with a Viewdata set to dial his number instead of the Prestel number. However, there is one snag: The Post Office can of course, charge its customers on account (since it can identify them from the telephone call), but the private operator will not be able to do this, or at least, not in the same way.
- Some good applications for Viewdata undoubtedly exist, but it is unlikely that the services will be widely used until the mid 80's.

Microcomputer Based Terminals

- A large variety of new microprocessor based products is available which overcome the price and capability limitations of early remote batch terminals.
- At the bottom end of the range are keyboard/printer terminals with tape cartridges (e.g., TI 770) designed for off-line data entry with store and forward capability. Also at the low end are small microcomputers such as Apple II which can be supplied with a communications interface (RS232C), floppy discs, a video terminal and a printer for around £3,500.
- Further up the range, there is a more powerful range of microcomputers in the range £5,000 to £10,000. Most of these are 8 bit machines, but have the advantage over those costing less than £5,000 in that they can be used with hard discs (fixed and exchangeable).
- Evidently, it is now possible to obtain a good remote batch terminal for around £3,500 to which others may be added as work expands. The main limitation to their usefulness at present is the shortage of high quality transmission error detection and correction software with mainframe equivalent software to match.

- UCSL have opted for Mohawk products as RBT's for their commercial users and Datema have chosen the Ontel 8 bit micro, which in addition to being a satisfactory RBT is also sold as a freestanding Word Processing system. The Ontel system may also be connected up with others on a common bus so as to share a central hard-disc drive which is accessed on a 'round robin' basis.

Printers and Stationery

- The technology of printing is evolving rapidly. The following changes are of importance:
 - . very low cost matrix printers (under £500),
 - . upper and lower case line printers,
 - . A4 size line printers,
 - . ultra high speed line printers (laser printers).
- There is increasing use of plain A4 continuous stationery (PODPS and Datema) and upper and lower case printing. This trend shows that technology is becoming more responsive to user's needs. Further evidence of this may be seen in newer stationery products, such as continuous feed and auto-stacking, letterhead and continuous envelopes. These labour saving products have not as yet made much impact on the market.

Memory

- The size of user's computer memories has increased considerably as prices per megabyte have fallen to below \$20,000. Memory costs will continue to fall through the 80's since a potential increase of 100 fold in chip packing density still exists.

Disc Storage

- The main trend in the past two years has been towards high density fixed disc storage technology (e.g., IBM 3350). At the bottom end of the market, it is now possible to purchase a 10 Mb Winchester fixed disc drive for around £1,800 (without controller). This breakthrough will be a more common offering with microcomputers by 1981 when a wider variety of suitable controllers becomes readily available and when archival storage media of complementary design capacity also become readily available. Winchester discs are ideal for RBT's since they can be unloaded to a remote mainframe and because they are rugged and reliable (i.e., excellent for non ideal environments in the field).
- Given suitable archival storage and Winchester disc controllers, the average price of a typical single station 10 Mb storage 64 Kb Memory 8 bit microcomputer could fall by around 25% to £7,500. The equivalent cost of a 16 bit alternative could be nearer £10,000 than today's £12,000 to £14,000. This means that whereas the capital cost of hardware for a bottom end minicomputer business system was £20,000 to £30,000 in 1975, by 1981 the equivalent cost will have better than halved to between £7,500 and £15,000.
- At the bottom end of the 64 Kb microcomputer range, the 10 Mb Winchester disc based 8 bit microcomputers will compete strongly with the top end of the floppy disc based alternatives. The main objection to Winchester discs on small freestanding machines, is the high cost of solving the dumping and archival problem adequately. As RBT's however they are in a class of their own.

Microcomputer Systems Software

- Operating systems are improving rapidly and at least one example exists of 10 terminals running on a 64 Kb, 16 bit LSI - 11 based microcomputer with the NET 11 operating system supplied by Karlin computer services. There is also a new release of CP/M available to provide multi-terminal capability on 8 bit Intel 8080 and Zilog Z80 microcomputers. The main programming language for microcomputers is BASIC and will continue to be. PASCAL is likely to become the second most popular language after BASIC.

Mainframe Productivity Aids

- Of all the programming languages for mainframe computers, APL appears to offer the greatest advance in true productivity. Some quite spectacular productivity gains have been recorded. Many companies have produced report writers (such as Easytrieve) and these vary a good deal, the trade off being between ease of use and versatility to solve difficult reporting tasks.

System Generators

- One of the most interesting newer products come from CSS International. Called NOMAD, it is a very high level system generator. It combines a powerful and easy to use report generator with versatile database facilities. Perhaps its strongest point is the excellence of the documentation. As a mainframe based tool for system development, it probably offers greater productivity potential per man hour than any other product of a similar type available on mainframes.
- A good deal of development work is occurring on small freestanding machines aimed at eliminating almost completely the need for Applications Programming for certain applications. Three products of this type are INSTA-SYSTEM from Computer-SENSE, ADMIN from LMR Associates and COGITOR from Systematik (Sweden). Using these basic tools, a 'skeleton' application structure is established very quickly. With INSTA-SYSTEM a model application is created by means of a VDU based parameter list and the model is evolved interactively until the database structure, reporting and data validation meet the requirement. INSTA-SYSTEM operates under CP/M through a BASIC interpreter.
- System Generators are likely to become very important during the 80's. They offer lay user system maintainability without the inflexibility of packages as well as a breakthrough in system development speed.

Office Equipment and Automation

A revolution is taking place in the design of office typing and printing equipment. This revolution is being driven by microprocessor technology and by printing mechanisms. The familiar electro-mechanical typewriter technology is only persisting because of the enormous commitments to production equipment that exist. However, the modern typewriter of the 80's will only need an electronic keyboard, a daisywheel or golfball print head and a circuitboard to control the typewriter. The intrinsic value of the device will therefore be a fraction of that of an equivalent electro-mechanical product. At the bottom end will be simple electronic typewriters moving up through more sophisticated devices with editing, buffered printing and page storage to full word processing systems with intercommunicating capability at the top end.

IBM has so far had very little to offer the word processing user with its obsolete MC 70/80 card based systems, the limited System 6 and the expensive 3730. However, with its strong OP sales force and with word processing technology at its fingertips, some spectacular product announcements are overdue. Meanwhile companies such as Exxon and Xerox are consolidating their product ranges in the office products field and for the time being at least they have better equipment and software.

Many organisations are actively pursuing word processing in conjunction with electronic mail. Such systems will lead to the growth of many more integrated voice and data networks in larger companies in a bid to reduce inter-office communications costs, whilst at the same time making better use of existing telephone circuits.

Given the existence of such voice/data networks, it becomes easy to envisage viewdata sets, printers, keyboards and ordinary VDU's all linked to a local microprocessor. This will communicate with head office and provide two way information services, as 'highway' for the collection of financial accounts data direct from its origin and a voice track for telephone conversations. The day of the computer utility will have by then arrived. Organisations which will achieve such utilities by the mid 80's at the latest will be those with large investments in central facilities and the necessary skills to support them.

New IBM Products

- The installed IBM and PCM equipment base among 72 Bureaux listed in Appendix - C is analysed in Exhibit III-J.1.
- The mainframe population is of course constantly changing. The most surprising feature of the installed base at the moment is perhaps the fact that 22% of the installed base is still 360 series equipment. Also, there is a large number of small machines (e.g. IBM System 32, System 34, System 3) installed in Bureaux.
- Exhibit III-J.2 shows that IBM has moved onto a whole new price performance curve with its 4300 series equipment, which at the top end (4341) could damage prospects for the 303X series if sold in multiple configurations at central sites.
- The 4331 has a reported MIP rate of up to 1.3 times the 370/135. It therefore replaces and obsolesces the 370 models 115-2 and 125-2 and their earlier versions.
- The 4341 has a quoted MIP rate of 1.7 times that of the 370/148. It has some three times the power of the 370/138 which it therefore obsolesces together with the 370/148.
- The 4300 Series aims to consolidate further IBM's move towards fixed disc technology. The two main products for the 4300 Series are:-
 - . 3310 with 64.5 Mb (4331 only)
 - . 3370 with 570 Mb (4331 and 4341)
- First shipments of the 4341 are due in the first quarter of 1980.
- Of the PCM suppliers, only Itel and Amdahl are of real significance in the U.K.

EXHIBIT III-J.1

IBM COMPATIBLE BUREAU EQUIPMENT

	Hardware Size			
	Large	Medium	Small	Total
PCM	5	1	-	6
370 Series	29	10	2	41
360 Series	10	8	9	27
303X Series	7	-	-	7
GSD Products	-	7	32	39
TOTALS	51	26	43	20

Note: PCM = Plug Compatible Mainframe

EXHIBIT III-J.2

THE IBM PRODUCT CONTINUUM

o H SERIES (1981-3)

☒ 303X SERIES (77-78)
3031 3032 3033

☒ 4300 (E) SERIES (1979-80)
4331 Inca 3 4341 Maya 2

☒ 8100
8130 8140

* 370 SERIES
370/115 /125 /138 /148 /158 /168

3X SERIES ☒
32 34 (36) 38

S/3

*

COMMERCIAL POSTURE

- * Obsolete
- ☒ Current
- o New Announcements

- Amdahl machines are above the 4300 Series in power and therefore not likely to be impacted significantly by it. Amdahl must fight it out with IBM in the 303X market. Intel have already sold out under the pressure that these IBM releases have caused.
- IBM's prices for its new 64k chip memory on the 4300 series are \$20,000 per megabyte. This price drop will severely hit PCM's (Magnuson, National Semiconductor, Two Pi, IPL Systems, Cambridge Memories, Nanodata, Kardios, Citel).
- The IBM 8100 series leaves off where the IBM 4331 begins and is limited to a memory size of $\frac{1}{2}$ Mb. This product is not likely to be of much significance to the Bureau market except as a replacement for IBM 3790 communications processors and special purpose data entry systems.
- The IBM Series 1 minicomputer has been a great disappointment so far to the software houses who have found it difficult to use due to the poor quality of its basic software. It has also been supported totally inadequately in Europe.
- The new 8100 (3790 replacement) being marketed by DPD and overlapping the Series 1 in price and capability is likely to be used in preference to the Series 1 for remote intelligent on-site processors where, significant mainframe access and processing is needed. IBM's integrated DPD marketing of 8100's and mainframes together with their present technical support strength will combine to keep IBM's GSD people at arms length from Users unless and until the Series 1 becomes popular as a distributed processing system in its own right.
- The IBM System 38 is the next logical machine choice for the large number of System 3, 32 and 34 based Bureaux. A number of Bureaux said that this was their next intended machine.

- The price per MIP on the 4300 series is 40% to 50% lower than on the 3030 series machines and this is causing many uncommitted 3030 series prospects with large IBM mainframes to re-think their plans. The problem however is that while the 3030 series equipment is available now, the model 4341 will not be available until 1980 for most potential customers.
- Amdahl and Itel are well placed to displace successfully a number of large 370's, in the next two years into early 1981. This may well result in large second user 370 series machines going into the medium end of the Bureau market who will be looking for the most cost effective hardware deals available.
- IBM continue to be vulnerable due to long delivery times and their policy of refusing to quote delivery dates with orders.
- The top end of IBM's new product line, the H series, is not likely to become significantly available until 1982.
- The IBM product continuum is shown as Exhibit III-J.2.

K. IMPACT OF LEGISLATION

- Five main areas of legislation are of concern to the computer services industry:
 - Sale of Goods Act,
 - Privacy,
 - Security
 - Computer Printed Output
 - Copyright Law.

Sale of Goods Act

- Changes in the sale of goods act have resulted in the re-writing of many standard contracts for the sale of computer equipment and software. Of particular concern to a bureau, could be liabilities to clients for errors caused by computer manufacturers equipment, software or technical support staff.

Privacy

- Government white papers are available on the subject of computers and privacy. Political interest is increasing expecially in the areas of data exchange between local and central government organisations. There is also considerable interest in what should be stored in personnel records held by private limited companies, who should access such information, and what rights of access the subject of such records should have.
- During the 1980's legislation is expected in these areas even though the advent of computers has little to do with the problem - it has always existed. Computers have merely sharpened the focus of attention on an area of increasing concern.
- Potential users of bureaux are, perhaps unnecessarily suspicious of bureaux whose major shareholders are in the same business. There is real concern about the scope for poaching or examining data belonging to a competitor. This concern can have a definite negative effect on a bureau's sales prospects in certain markets. Paradoxically therefore it may be difficult for say Laing computer services to sell its construction industry expertise to small construction industry firms.

Security

- Fraudulent activities by computer or other staff with access to a computer are increásing. An analysis of 64 cases of fraud occuring between 1964 and 1973 showed an average loss per fraud of \$1.4M (source Financial Times, 3/3/78). Only 7% of these frauds were perpetrated by programmers which means that most were committed by users of computers.

Computer Printed Output

- ③ Recently the court of appeals up held an appeal against the conviction of Stuart Pettigrew on a charge of burglary (see Computing 7th February and The Times 5th February). The appeal relates to the admissibility of printed computer output in cases of fraud. As a result of the success of the appeal, a loophole has been identified in the Criminal Evidence Act 1965 relating to admission as evidence of trade and business records. Such output is admissible only in certain very special circumstances. Admissibility depends on the principle of personal knowledge by the person responsible for handling the data, of the data that is involved. Similarly whilst microfilm is admissible as evidence in cases of fraud it is not necessarily sufficient evidence. For example a judgement hanging on the authenticity of a signature on a travellers cheque would require production of the original cheque. A microfilm copy would be insufficient evidence.

Copyright

- ③ It is well known that software has been impossible to patent. However, the law of copyright does have some relevance and it appears that advancing technology is forcing a re-appraisal of what is meant by copyright rights. A recently published book on the subject by Michael F. Flint "A User's Guide to Copyright" is available which specifically covers the problems of the computer industry. It is published by Butterworth. A recent case in the U.S.A. resulted in the judgement that only material which can be read by the human eye can be covered by copyright; computer software on disc, magnetic tape, punched cards, chips etc., are thus excluded.

IV. BUREAU SERVICE PROVIDERS

IV. BUREAU SERVICE PROVIDERS

A. TYPE OF SERVICE

- A list of service definitions appears as Appendix - A to this report.
- The three basic categories used in this report for IBM based Bureaux are:
 - Batch
 - RCS (Remote Computing Services)
 - Comprehensive

• Batch

To qualify for the "Batch" classification, a Bureau must have magnetic tape handling facilities at its main centre. Several Bureaux operate an RJE link to an overseas mainframe which rules them out of the batch category.

• RCS

- (a) Bureaux with mainframes supporting RJE terminals at User sites
- (b) Bureaux providing batch processing services using an RJE facility linked to a mainframe computer located elsewhere. In this case there are no magnetic tape handling facilities at the Bureau.
- (c) Bureau providing interactive services through a network of mainly unintelligent terminals.
- (d) Bureaux providing mainframe processing back up support over data transmission lines connected to on-site minicomputers or small mainframes.

- The Comprehensive category covers any size of Bureau which provides a Batch, Interactive and RJE facilities (not necessarily on the same machine).
- INPUT's sample of Bureaux summarised in Appendix B covers 72 with IBM only or IBM and other computers. Input also has records of 66 Bureaux with ICL only or ICL and other computers. To avoid double counting in IBM/ICL comparisons, the following Bureaux with both IBM and ICL equipment have been re-classified by their dominant mainframe supplier.

<u>Mainly IBM</u>	<u>Mainly ICL</u>
BOC	Boeing
Centrefile	Hadrian
Compower	Douglas Moore
GMS	NDPS
GRIP	

After this re-classification, there are 68 IBM Bureaux and 61 ICL Bureaux making a total of 129 for both categories.

- More than three-quarters of ICL Bureaux are predominantly batch orientated whereas only two-thirds of IBM Bureaux are basically batch service orientated (see Exhibit IV-A.1).
- Included in this review are IBM compatible equipment alternatives (ITEL and Amdahl).
- At the lower end of the Bureau market, there are several Data Preparation Bureaux and there is also one significant IBM based Word Processing Bureau.
- Service revenues vary by a factor of about two to one in relation to installed hardware value. At the top end, are services which have a high value added component - applications packages. At the bottom end providers of low value added services (raw time or program development services) can apply only around one-half of the mark-up on machine charges for service that is applied by the high added value providers.

EXHIBIT IV-A.1

DISTRIBUTION OF ICL AND IBM BUREAUX
BY SERVICE TYPE

BUREAU TYPE	IBM	ICL	TOTALS
Batch	46	47	93
RCS	12	7	19
Comprehensive	10	7	17
TOTALS	68	61	129

- Perhaps the major new interest is the development of bureau time wholesaling. TEAMCO currently provides machine power to six smaller bureaux who have replaced their medium sized mainframes with RJE terminals.
- Appendix - C provides a classification of the IBM Bureaux in terms of the industry sectors which each bureau provides services to.
- Appendix - D provides a general classification by Applications type for each IBM Bureau. The main split is between General Business Applications and Engineering/Scientific Applications.

B. OWNERSHIP

- IBM equipment Bureaux are classified in one of three ways:
 - Captive : Companies that have typically been in-house DP departments. The original parent company still purchases more than 30% of available capacity.
 - Private : Companies set up by individuals who retain overall voting control.
 - Corporate : Companies in which no single customer accounts for 30% or more of sales revenue. Voting control rests with outside corporations rather than executive management.
- One half of the IBM Bureaux are captive and of the seven Bureaux with sales exceeding £10m, six are captive (see Exhibit IV-B.1).
- One-half of the IBM Bureaux which are Corporate, had sales running at less than £1m in 1978/9.
- Of the IBM Bureaux, only 12% are Private whereas 39% of ICL Bureaux are under Private control.

EXHIBIT IV-B.1

BUREAU OWNERSHIP IN RELATION TO SIZE

Total Sales Revenue From All Services Including Captive Revenues £'m	Private	Captive	Corporate	Total
$T \geq 10$	-	5	2	7
$5 > T \geq 10$	-	4	3	7
$1 > T \geq 5$	1	9	7	17
$0 > T \geq 1$	7	15	15	37
TOTALS	8	33	27	68

C. GEOGRAPHIC DISPERSON

- Exhibit IV-C.1 shows that 47% of IBM Bureau external revenues are derived from machines based in London and the Home Counties.
- IBM based Bureaux dominate the market in Inner London, Wales and the West Country and Ireland. They are weak by comparison with ICL in the North and in Southern England.
- There appears to be only one IBM based Bureau (OSPREY) south of the Southern Home Counties and it is very small.
- The strength of IBM based bureaux in Ireland is due entirely to CARA the Aer Lingus subsidiary.
- Revenue distribution can be distorted by the treatment of the larger Bureaux with mixed mainframe suppliers. These typically offer services on a wide and sometimes national coverage by means of their networks.
- Revenue is captured on a wide geographic basis by the following seven Bureaux in the IBM list:

BOC	NDPS
COMPOWER	RHM
GEC MIDLAND	UCSL
IBM	

These seven IBM Bureaux represent 42% of all IBM Bureaux external revenues.

- Exhibit IV-C.1 shows a column in which external sales figures by region have been adjusted by re-distributing the externally derived revenues of the above seven Bureaux equally across all regions. This is an approximate correction because it does not allow for regional strengths and weaknesses by each of these operators. The effect of this redistribution of revenue is to reduce substantially the inner London area and Midlands revenues and produce a corresponding increase across the other regions.

EXHIBIT IV-C.1

GEOGRAPHIC DISPERSION OF IBM BUREAUX

Region	No. IBM Bureaux	Total Revenue £'m	External Revenue £'m	Corrected External Revenue £'m	% Revenue Distribution (Corrected)	No. ICL Bureaux
London	25	58.82	22.59	12.34	23.3	9
Northern H.C.	5	11.00	3.29	4.45	8.4	7
Southern H.C.	10	19.03	11.01	8.15	15.3	13
Southern England	1	.05	.05	2.86	5.4	5
Midlands	6	22.75	8.39	3.52	6.6	6
Ireland	5	5.33	2.79	5.62	10.5	1
Wales/West	6	2.96	1.92	4.73	8.9	2
East Anglia	4	1.21	.80	3.52	6.6	3
North	3	1.09	.24	3.05	5.7	13
Scotland	3	2.10	2.10	4.94	9.3	2
TOTALS	68	124.34	53.18	53.18	100	61

D. SIZE AND SHARE OF BUREAU MARKET

- INPUT maintain records on 481 Computer Service Bureaux in the U.K. given the continuous entry of new operators, the consolidation of existing organisations and those dropping out, the records represent approximately 95% of the Bureaux population. The overall market shape is shown in Exhibit IV-D.1.
- The 68 IBM mainstream Bureaux were classified as primarily Batch, Remote Batch or Comprehensive. Their distribution is shown in Exhibit IV-D.2.
- INPUT's 1979, estimate for the total computer services market is shown in Exhibit IV-D.3 together with an estimate of the size of the market for IBM based services. More details of the market for IBM based services appear in Exhibit IV-D.4.
- INPUT estimates that mainstream Remote Batch Bureaux on average are deriving 10% of their revenues from time sharing interactive work, 25% of their revenues from batch work submitted remotely and 65% from RJE.
- Mainstream Comprehensive Bureaux on average are estimated to be deriving 25% of revenues from interactive time sharing services, 50% from RJE and 25% over the counter batch work.
- The average overall rate of growth of the Bureau Sector appears to be in the region of 27% p.a. in 1979. Direct telephone checks with a number of organisations were made which confirmed this statement.
- The larger Bureaux said that their batch work was becoming a smaller share of their total services. The growth rate of the batch sector is in the region of 15% p.a. currently.
- It is popularly believed that IBM Based Bureaux are weak in the interactive time sharing market. Exhibit IV-D.5 shows that they have 15% of it.

EXHIBIT IV-D.1

COMPUTER SERVICES MARKET - SUMMARY PROFILE

Service Type	Large		Medium		Small		Total	
	Qty	%	Qty	%	Qty	%	Qty	%
Remote Computer Services Bureau (RCS)	9	1.9	36	7.5	13	2.7	58	12.1
Batch Bureau	1	0.2	35	7.3	89	18.5	125	26.0
Specialist Bureau (Data Prep, OCR COM etc)	-	-	7	1.5	67	13.9	74	15.4
Professional Services (Systems & Software)	9	1.9	47	9.8	168	34.9	224	46.6
TOTALS	19	4.0	125	26.0	337	70.2	481	100.0

EXHIBIT IV-D.2

ESTIMATED 1979 REVENUE
DISTRIBUTION BY SERVICE TYPE - IBM BUREAUX

Primary Service	Number of Bureaux	Total Bureau Sales £'m
Batch	44	15.99
Remote Batch	14	12.33
Comprehensive	10	25.74
TOTAL	68	54.06

EXHIBIT IV-D.3

IBM BASED BUREAUX SHARE OF 1979
ESTIMATES FOR TOTAL COMPUTER SERVICES MARKET

	T/S	RJE	Batch	Other	Total
Total UK Computer Services Market Estimate £'m	47.6	49.4	108.3	155.0	360.3
IBM Based Companies	7.1	22.0	24.96	24.15	78.2
IBM Based Share %	15	44	23	16	22

Note: £1 = \$2.4 conversion base.

EXHIBIT IV-D.4

ESTIMATED 1979 NON-CAPTIVE IBM BASED
BUREAU MARKET BY SERVICE TYPE

Supplier Type \ Service	Time Sharing	Remote Batch	Batch	Total
Batch	-	-	15.99	15.99
Remote Batch	1.23	8.01	3.09	12.33
Comprehensive	5.87	13.99	5.88	25.74
Total/£'m	7.10	22.00	24.96	54.06
Distribution %	13.1	40.7	46.2	100.00

Note: Figures embrace the 72 Bureaux listed in Appendix - A.

EXHIBIT IV-D.5MARKET SHARES - ICL & IBM

	T/S	R/B	Batch	Other	Total
IBM %	15	44	23	16	22
ICL %	14	15	29	23	23
Other %	71	41	48	61	55
TOTALS %	100	100	100	100	100

- The reason for the significance of IBM based time sharing services in spite of a poor interactive product range is due to the sheer weight of IBM based machine capacity at the larger end of the market.
- The market growth rate for remote computing services (RJE and T/S) is said by Bureaux sampled by telephone to be in the range 35-50% p.a. at present. Most of this growth is from interactive service demand.

E. MAJOR IBM BUREAUX

- Of the 257 mainstream computer Bureaux in INPUT's records, 129 (50%) are either IBM or ICL based.
- Exhibit IV-E.1 shows that by comparison with ICL, IBM have a much larger share of the large Bureaux.
- Of the 17 IBM or ICL Bureaux with overall sales turnovers of £5m or more, 14 (82%) are IBM based.
- Of the 112 Bureaux with sales turnovers of under £5m, IBM and ICL have an even distribution by size.
- Although Exhibit IV-E.1 has used the overall sales figures for each Bureau (including professional services and captive revenue), this is arguably the best basis on which to classify IBM Bureaux by size. The larger Bureaux are of course the most important in terms of market revenue impact, and they tend to be quixotic about divulging information about captive revenues. For this reason, INPUT has had to estimate the captive share of revenue in some significant cases.

EXHIBIT IV-E.1

IBM/ICL BUREAUX - SIZE COMPARISON

Total Services Including Captive and Professional Services			IBM		ICL		TOTAL ICL IBM	
£'m			Qty	%	Qty	%	Qty	%
	T	5	14	21	3	5	17	13
1	T	5	16	23	16	26	32	25
0	T	1	38	56	42	69	80	62
TOTALS			68	100	61	100	129	100

In Appendix - B INPUT has estimated Bureau Sales revenues in four columns:

- Total Sales
- Total Bureau Sales
- Total Bureau IBM Sales
- External Bureau IBM Sales.

These figures are estimated from the following considerations:

- (a) Proportion of total staff employed on professional services activities which produce substantial direct revenue
- (b) Proportion of machine capacity attributable to IBM supplied hardware.
- (c) Proportion of non-captive bureau sales.

The method of applying these yardsticks to the major Bureaux can be demonstrated using Compower as an example:

<u>Revenue Type</u>	<u>Estimated Total Sales Revenue £ m</u>
(i) 300 Professional Staff at £16,500/P.P.p.a.	4.95
(ii) IBM Mainframe Revenues	
4 x Large £6.5m	
1 x Medium £0.4m	
1 x Small £0.2m	7.10
(iii) ICL Mainframe Revenues	
3 x Large £3.3	
1 x Medium £0.6	3.90
ESTIMATED TOTALS	£15.95m

COMPOWER supplies the NCB's computer requirements and given the size of the NCB and the total COMPOWER hardware inventory, INPUT estimate that 60% of resources are devoted to captive NCB work. This gives an estimated 40% or £2.84m of external IBM sales.

• The above example for a large captive IBM based bureau shows the basis of INPUT's estimates. It also shows that the significance of the major captive Bureaux can be easily overstated. This point applies to IBM's own RCS bureau activities, the majority of which are used by IBM staff (often on behalf of clients which do not pay directly for it).

• The main criteria for classifying bureaux by size are:

- (a) Total processing or data transmission capacity (whichever is the limiting factor)
- (b) Total external sales of Bureau, professional and other services
- (c) Total Bureau sales including direct technical support.
- (d) Bureau sales by mainframe supplier.

Not surprisingly the ranking of Bureaux varies according to the criteria of size used. Exhibit IV-E.2 shows how dramatically ranking position can vary.

• Low added value Bureaux include GEISCO, IBM's CALL service and TEAMCO's wholesaling operation. The best example of a high added value Bureau is Hoskyns. The mark up on raw computer time will vary by a factor of two to two and one-half to one depending on the added value content of services.

• These rankings are the best guides at present available. Due to the volatile growth of the Bureau market at the present time, rankings could change a good deal and should be treated with caution. IBM will rise rapidly in the rankings when the Warwick centre is effectively at full strength.

EXHIBIT IV-E.2

TOP TEN COMPUTER BUREAU RANKINGS

RANK	ALL RCS BUREAUX	IBM BUREAUX	
		BY TOTAL CAPACITY	BY EXTERNAL SALES REVENUE
1	GEISCO	IBM	BOC
2	IBM	BOC	IBM
3	BOC	COMPOWER	UCSL
4	COMSHARE	GEC MIDLAND	CEGB
5	UCSL	UCSL	LOWNDES AJAX
6	CENTREFILE	GECB	COMPOWER
7	ADP	CENTREFILE	GEC MIDLAND
8	SIA	HOSKYNS	CARA
9	ATKINS	CARA	RHM
10	SCICON	GRIP	HOSKYNS

F. IBM AS A COMPUTER BUREAU

- The most important announcement likely to affect the Bureau Market is IBM's new RCS Bureau a "Supercentre" at Warwick. Here, there are several large IBM 370/168's already and short term plans exist to install up to six machines of this size (or a machine complex of equivalent capacity). There will be 174,000 square feet of premises and 80 high speed lines giving international network facilities. System 7 minicomputers from IBM's existing product range will operate as network multiplexers. IBM Computers located elsewhere (Croydon, Manchester, Birmingham and London) will be used by IBM and Customers for testing. They are not part of the RCS organisation.
- RCS (Remote Computing Services) is the term used to define on-line services which increasingly include both Interactive and Remote Batch Processing features. Software evolution is gradually bringing together RJE and Interactive facilities within the same Operating System. For example CDC plan to use their NOS operating system on the CYBER computers for all future remote computing whatever the mode of service.
- IBM now offers four main products under the Remote Computing Services category.
 1. CALL
 2. VSPC (Virtual Storage Personal Computing)
 3. VMPS (Virtual Machine Productivity Service)
 4. TBS (Terminal Business System)
- CALL is IBM's main RCS product, but it is not available for use by Bureau providers other than IBM, or on end user's machines. This has been a major restriction on persons wishing to develop interactive programs on a bureau basis to run later on in-house IBM machines. Proprietary non-IBM developed alternatives such as ROSCOE exist and larger IBM in-house computers have had IBM's own TSO software available for time-sharing. TSO is not compatible with CALL.

- VSPC is available through IBM's RCS Bureau and to IBM based bureaux and to end users. It is likely to replace CALL as IBM's main time sharing system. COBOL is not available with VSPC. VSPC is supported from IBM's Zoetermeer Centre in Holland (an extension of the Warwick RCS facilities).

VMPS supports COBOL as well as the other VSPC languages (APL, BASIC, FORTRAN and PL/I). VMPS uses the security and versatility of the virtual machine operating system philosophy to provide a vehicle for IBM licensed program products. It is only suitable for mainframes with sufficient power to bear the overhead cost of running VM. VMPS is supported on a 370/158 based at IBM's Croydon Centre which is used for customer testing.

- TBS is primarily a remote batch processing system, but it does have conversational features. It offers a standard range of order entry, general accounting, invoicing and stock control packages on an RCS basis from IBM's Warwick Computer Centre.

V. MARKET OPPORTUNITIES

V. TRENDS AND MARKET OPPORTUNITIES

- Market opportunities exist in many areas of the computer services industry. Each opportunity can only be evaluated in relation to the capital available for investment, the skills available and the 'degree of fit' between the opportunity and the existing profile of services being offered.

A. SCENARIO FOR THE 1980's

- In the 1980's, the threshold from which the decade begins has the following profile:

Present Position

- During the past year, IBM has massively improved the case for staying with mainframes among those installations where a switch to minicomputers for price performance advantages looked the right thing to do in 1978. The cost performance of the 4300 series in particular is very good indeed.
- Potential users are being carried along on a wave of aggressive selling by the distributed processing vendors. The less well informed seem deaf to the voices of those pointing out the far from satisfactory situation regarding field software support for minicomputer installations. The structure of this technical support to many distributed processing installations is very shaky.
- The selling effort being invested in microcomputers is stimulating the market as never before and the public at large in the 80's now begins to understand something about the new technology.

- A whole new infrastructure is evolving to handle the microcomputer opportunities in the commercial data processing sector. Some large sales chains (e.g., Curries) are in evidence and these are working out plans for territory based software support for customers. Traditional suppliers of hardware which embody high cost of sales are looking to 'alternative distribution channels' to remain competitive with micro system pricing.
- Smaller Batch bureaux without the resources to invest in modern computers are tending to turn into OEM's (e.g., SCAN). Some are throwing out their obsolete mainframes and switching customers onto an RJE service linked to a time wholesaler (e.g., TEAMCO).
- Prestel and Packet Switching services are two new Post Office ventures of importance. Neither has yet achieved anything of commercial significance, but their potential is good.
- Computer based telephone exchanges are becoming cheaper with newer and smaller models available. So far, they have only had much impact in large companies (e.g., MARS, Thomas Cook, Bland Payne).
- Speech synthesis technology has improved to the point where some genuinely good applications have at last been realised.
- Computer technology has had a negligible impact on employment so far.

The Future

- The proliferation of QWERTY keyboards into schools (for computer education), offices and homes means that just about everyone will learn to type. Thus developments such as Datapad for hand printed computer input will continue to have little impact. Keyboard data entry will prevail against all other methods during the 1980's.

- Increased crime (forecast for the first half of the 1980's), pressure on trading margins and the attraction of more convenience will lead to greater use of all forms of technology that minimise the amount of cash carried about and handled through cash tills. Credit cards, travellers cheques and cash dispensing cards will therefore be more widely used. A new form of card, the debit or deposit card, will find a place in the market (the first of these EPROM devices has been announced by the Italian company SGS-ATES). Advanced versions will have increased deposit/debit capacity. They will find applications in such places as private clubs wishing to avoid cash handling for reasons of security and petty embezzlement.
- Employment has not been adversely affected in the first 25 years of the computer industry to 1980. Predictions for the 1980's revolve around the likely effects of the microprocessor revolution. INPUT's view is that the effects will be of two types: First in administration and secondly in production.
- In administration, there will be a reduction in typing, filing and distribution work due to the greatly increased productivity of word processor based units and office filing and communication systems which will affect typists and secretaries. Other significant job savings in the administrative area will depend on a firm's ability to find ways of avoiding the need for paper. Microprocessors will help eliminate paper directly - especially in the area of source data capture. Typing unit staff rather than secretaries will be the main users of Word Processing computers. Secretaries will be the main users of electronic memory typewriters.
- In the production area, the effects will be more dramatic. The digital watch is a good example of how less skilled low labour intensive work replaced highly skilled high labour and capital intensive work. The manufacture of computers is itself becoming less labour intensive as more and more is being integrated onto smaller and smaller chips. The production of electronic typewriters will eliminate a great deal of assembly and maintenance work carried out by engineering workers. The demand for conventional tooling and plant will decline and this will impact on primary industries (iron and steel).

- Developments covered by "Office of the Future" strategy will be led by those organisations with a fundamental need for sophisticated data and/or voice communication. These companies will include airlines, travel firms, banks, building societies and financial institutions. Electronic mail will only develop quickly in those areas where rapid data communication is the essence of the business, although for internal communications this development will be more general.
- Computer bureaux will consolidate into larger units as the smaller ones are squeezed by their large and more price competitive counterparts on the one side and the aggressive activities of distributed processing vendors on the other. The frequency of acquisitions will be maintained at current levels. Pan Europe and U.S. acquisitions will broaden to include other important commercial centres such as Canada, the Middle East and the far East.
- There will be a concentration of bureaux on vertical industry markets. Also, especially in the second half of the decade, more big, specialised databanks will be on-line for either data-based information or text-based information.
- It is likely that growth of Remote Batch processing will be boosted in the form of User Site Hardware Services as better and lower cost user orientated systems become available. Interactive services will continue to develop strongly and Batch processing on a local basis will decline steadily but slowly throughout the decade. Batch processing will be a big market for some time yet. Interactive bureaux will increasingly place minicomputers in user sites on a managed facility basis. These minicomputers will be connected on-line to the interactive bureau networks. ADP is already doing this with on site PDP 10's.
- The middleground of minicomputers will be under heavy pressure from massive price performance mainframe improvements and very cost effective micro-computers. Indeed the Digital Equipment Corporation is already taking steps to reduce its output in anticipation of a smaller average number of systems sold per user.

- 8 bit microcomputers will not be ousted by 16 bit microcomputers until the second half of the decade. The investment in 8 bit software is simply too great. Also there is a very large market which does not need the extra power and memory capability of 16 bit processors.
- By 1984, Xerox predict that 30% of all typewriters sold will be electronic memory based machines (as opposed to Word Processing Computers). These will be sold primarily to secretaries whose needs are for short documents required to be turned around very quickly but with no need for long term retention on disks. The combined impact of word processing services in-house, and computer based telephone facilities, will reduce the demand for secretaries by the middle 1980's.
- On the telecommunications side of its business, Post Office costs will continue to rise in sympathy with inflation. Packet switching uses will increase as fast as the Post Office can provide suitable equipment. Increased capacity for message traffic with such technologies as fibre optics will evolve in the latter part of the decade. Some of the cost and performance advantages of the widening range of telecommunications services in the 1980's will significantly erode the mail service and push it beyond an acceptable operating cost to volume ratio.
- Some good in-company applications exist for PRESTEL, but it is likely to get off the ground slowly. Little domestic household use is expected before the second half of the decade.
- Growth of microcomputer use for commercial data processing will be limited by the absence of a field solution to the software maintenance problem. There will be strong demand for 'System Generators' which avoid the need for applications programmers. Analysts will increasingly specify applications directly onto computers via terminals by entering parameters which specify data structures, data validation and reports. The computer will generate the necessary applications programs automatically. Examples of these already exist on a commercial basis.
- A big market for consumer and industrial products with microprocessor controls incorporated within them will open up in the early 1980's. Good areas will be energy management, toys and games, security, household gadgets and factory process control.

B. MARKET OPPORTUNITIES

Background

- The fastest growth sector is software products; commercial data processing applications software will be the largest opportunity within it.
- Within the professional services sector, Education and Training is the fastest growth segment.
- The fastest growing segment of the bureau sector is Interactive services.
- Local Batch processing will continue to account, through the first half of the 80's, for a very large slice of the bureau services market.
- Remote Batch services have got off to a poor start due to the excessive cost of terminals in relation to processing costs. Future growth will depend on the availability of terminal equipment, priced economically.
- The sale of bureau services in the 80's will be in an aggressive market place under strong attack from micro and minicomputer suppliers.
- The rapidly falling cost of hardware and basic software have given fresh impetus to the market for industrial and domestic computer products. These include process control systems, instrumentation, telemetry and micro-processor controlled consumer products (toys and household gadgets). The competition in this sector of the market is not yet anything like as strong as it is in the commercial data processing arena and therefore offers plenty of scope for new entrants to the market for computer services.

Geographical Opportunities For Computer Bureaux

- The North Midlands and Southern England are sparsely populated by locally based computer bureaux and they are particularly sparsely populated by locally based IBM bureau services. The main bureau operators based on the West side of London are BOC, NDPS, Computel and BARIC. Slough is a good opportunity area.

Opportunities For Low Added Value Services

- Low added value services include computer time wholesaling and general purpose timesharing. TEAMCO have identified and successfully exploited time wholesaling to smaller bureaux with obsolete equipment. Opportunities exist for new entrants to this market.
- There are always good opportunities in a fast growing market. Success depends on being able to move fast and develop an area of special expertise. This has been demonstrated particularly well by COMSHARE and IP SHARP, both of which were late but successful entrants to the interactive services market. Another late entrant - CSS International - is more notable for its lack of success in the U.K., with a superb product (NOMAD). CSS have failed to back the product with the right RBT equipment or with the applications expertise in either vertical or cross industry markets that is needed in order to exploit its potential.

Commercial Data Processing Applications Opportunities

- Manufacturing industry (including Construction), Banking and Finance and central Government are the principal sources of bureau revenue in the U.K., accounting for 60% of the total. Banking and Finance is a specialist vertical market with a city based geographical concentration. This is not a good opportunity for new entrants in view of the highly competitive services already available based on special sector applications expertise.

- One of the fastest growth sectors which does not appear in the statistics available from established sources is mail order. A number of bureaux (UCC, Datema, Southwark Computer Services) are developing services for this market opportunity. The need is for local order processing and stock management backed up by a bureau services for customer list updating and mailing. Thus mail order offers an ideal Remote Batch vertical market for Bureaux.
- The Construction industry is a very large vertical market which has been slow to computerise. An opportunity exists for the development of integrated financial accounting and contract costing services. These could be either on a bureau basis or on a turnkey basis.
- The Manufacturing industry still offers enormous potential for general accounting, stock control and specialist applications. These are regarded as horizontal or cross industry applications products.
- A host of vertical market opportunities have been identified by the vendors of minicomputers and microcomputers. The principal ones include:
 - Accounting Practices,
 - Insurance Brokers,
 - Estate Agents,
 - Building Societies,
 - Solicitors,
 - Travel Agents,
 - Commodity Traders and Stock Brokers,
 - Hotels,
 - Subscription Services (e.g., Magazines),
 - Motor Dealers,
 - Wine and Spirits Merchants.
- The general characteristics here tend to be market sectors that are easy to research through trade and professional associations. There are of course many other potential vertical markets. Whether any of these (or other) vertical markets is a good opportunity depends entirely upon the application speciality know how available to devote to a vertical market venture.

Speciality Services

- Opportunities exist for setting up specialist databanks comprising proprietary information. Greater progress has been made in Europe than in the U.K. Some of the major databanks cover such areas as medical and library abstracts, hotel beds, personnel (e.g., computer dating), second hand cars and more recently - privately owned homes for sale.
- Some large databanks have also been established for direct mailing to industry and commerce. As the decade proceeds, an increasing amount of marketing will be performed by dedicated bureau resources and this will proceed to supply of the service (e.g., ticketing, house buying, catalogue ordering etc).

Industry Automation

- The government is making substantial funds available for education and training in the microprocessor area. So far, most of the education and training has been orientated towards the design and selection of hardware and applications for commercial data processing. There is a big opportunity for training in the design of microprocessor controls for consumer and industrial products.
- The process control market is easy to overlook since it is small by comparison with that for commercial data processing. New microprocessor products, give a boost to the opportunities in this sector. The main opportunity arises due to the large potential market size and the limited competition.

APPENDICES

APPENDIX - A

DEFINITIONS

APPENDIX - A

DEFINITIONS

COMPUTER SERVICES

These are services provided by vendors which perform data processing functions using vendor computers, or assist users to perform such functions on their own computers.

The following are definitions of the modes of service used in this report:

REMOTE COMPUTING SERVICES (RCS)

Provisions of data processing to a user by means of terminals at the user's site/s connected by a data communications network to the vendor's central computer. The three sub-modes of RCS are:

1. INTERACTIVE (timesharing) is characterised by interaction of the user with the system, primarily for problem solving timesharing, but also for data entry and transaction processing; the user is "on-line" to the program/files.
2. REMOTE BATCH is where the user hands over control of a job to the vendor's computer which schedules job execution according to priorities and resource requirements.
3. ON SITE computing is a remote computing services (usually on a mini computer) provided by and connected to a computer service company installation. The mini computer enables the user to do processing against small files locally whilst resorting to the link with the computer service company installation for heavy processing power, manipulation of mass files and use of high speed output services.

BATCH SERVICES

This includes data processing performed at vendor's sites of user programmes and/or data which are physically transported (as opposed to electronically by telecommunications media) to and/or from those sites. Data entry and data output services, such as keypunching and COM processing, are also included. Batch services include those expenditures by users which take their data to a vendor site which has a terminal connected to a remote computer used for the actual processing.

FACILITIES MANAGEMENT (FM)

(Also referred to as "Resource Management" or "Systems Management"). The Management of all or part of a user's data processing functions under a long-term contract (not less than one year). To qualify as FM, the contractor must directly plan and control as well as operate the facility provided to the user on-site, through communications lines, or in mixed mode. Simply providing resources, even though under a long-term contract and/or for all of a users' processing needs, does not necessarily qualify as FM.

PROFESSIONAL SERVICES

Management consulting related to EDP, systems consulting, systems design and programming, and other professional services are included in this category. Services can be provided on a basis of: "Time and Materials", whereby the user pays for the time used on an individual on a daily or other fixed rate, or "Fixed Price", where the user pays a fixed fee for a specific task or series of tasks.

SOFTWARE PRODUCTS

This category is for users' purchases of systems and applications packages for use on in-house computer systems. The figures quoted include lease and purchase expenditures, as well as fees for work performed by the vendor to implement and maintain the package at the users' sites. Fees for work performed by organisations other than the package vendor are counted in professional services. The two sub-categories are:

1. SYSTEMS PACKAGES are operating systems, utilities, and language routines that enable the computer/communications system to perform basic functions. This software is provided by the mainframe manufacturers with their hardware; other vendors provide improved versions of this and special-purpose routines. This classification includes compilers, data base management software, communications packages, simulators, performance measurement software, diagnostic software, and sorts.
2. APPLICATIONS PACKAGES are software which perform processing to serve user functions. They consist of general purpose packages, such as for accounting and inventory control, and special purpose packages, such as personal trust, airline scheduling, and demand deposit accounting.

PROCESSING SERVICES

Processing services encompass FM, RCS, and batch services: they are categorised by type of service, as distinguished from mode of service, bought by users as follows:

- GENERAL BUSINESS services are processing service for applications which are common to users across industry categories. Software is provided by the vendor; this can be a complete package, such as a payroll package, or an application "tool", such as a budgeting model, where a user provides much of the customising of the finished product it uses. General business processing is often repetitive and transaction oriented.

- SCIENTIFIC AND ENGINEERING services are the processing of scientific and engineering problems for users across industries. The problems usually involve the solution of mathematical equations. Processing is generally problem solving and is non-repetitive, except in the sense that the same packages or "tools" are used to address different, but similar, problems.
- INDUSTRY SPECIALITY services provide processing for particular functions of problems unique to an industry or industry group. The software is provided by the vendor either as a complete package or as an application "tool" which the user employs to produce its unique solution. Speciality applications can be either business or scientific in orientation; data base services where the vendor supplies the data base and controls access to it (although it may be owned by a third party) are also included under this category. Examples of industry speciality applications are: seismic data processing, numerically-controlled machine tool software development, and demand deposit accounting.
- UTILITY services are those where the vendor provides access to a computer and/or communications network with basic software that enables any user to develop its own problem solution or processing system. These basic tools include terminal handling software, sorts, language compilers, data base management systems, information retrieval software, scientific library routines, and other systems software.

APPENDIX - B

IBM BUREAUX SALES REVENUE ESTIMATES

UK COMPUTER BUREAU REVENUES - IBM SECTOR

ESTIMATED SALES 1979 £'m										
SALES COMPANY	TOTAL SALES	TOTAL BUREAU SALES	TOTAL BUREAU IBM ONLY	IBM SHARE %	EXTERNAL SALES %	IBM £'m	SIZE	AREA	OWNERSHIP	TYPE
AGB COMPUTER	4.00	1.75	1.00	57	20	.20	S	NH	C	B
AMBA	.06	.01	.01	100	100	.01	S	SH	P	R
ANGLIA	.80	.32	.32	100	50	.16	S	A	C	B
ASTRAL	.48	.25	.25	100	100	.25	S	L	C	B
AUTO SERVICES	.30	.15	.15	100	50	.08	S	SH	C	B
BARBICAN	.35	.17	.17	100	80	.14	S	L	C	B
BLUE CIRCLE	2.50	1.50	1.50	100	15	.22	S	L	C	R
BOC	31.00	12.80	8.53	67	67	5.68	L	SH	C	C
BOEING	2.70	1.60	.30	19	100	.30	M	NH	C	C
BROWNBILL	.30	.05	.05	100	100	.05	S	N	P	B
BURY	.20	.08	.08	100	100	.08	S	A	C	B
CARA	5.25	4.75	4.50	95	50	2.25	M	I	C	B
CENTREFILE	9.50	6.10	3.00	49	100	3.00	L	L	O	R
CONTROL DATA	6.25	3.95	1.95	25	90	1.75	M	L	O	C
CEGB	10.50	8.00	7.00	87	28	1.40	M	L	C	C

UK COMPUTER BUREAU REVENUES - IBM SECTOR

SALES COMPANY		ESTIMATED SALES 1979 £'m									
		TOTAL SALES	TOTAL BUREAU SALES	TOTAL BUREAU IBM ONLY	IBM SHARE %	EXTERNAL SALES %	IBM £'m	SIZE	AREA	OWNERSHIP	TYPE
COMPOWER		16.00	11.00	7.10	64	40	2.84	L	M	C	C
COMPUTIME		.15	.10	.10	100	100	.10	S	I	P	B
CRL		1.00	.65	.60	99	100	0.60	L	L	O	R
CSS		.50	.40	.40	100	100	.40	S	L	O	R
CYPHER		.24	.13	.02	15	75	.01	S	N	C	B
DATA COMPUTING		.80	.02	.02	100	100	.02	S	SH	O	B
DATA LINK		.60	.50	.50	100	100	.50	S	SH	O	B
DATA PUNCH		.65	.50	.50	100	100	.50	S	SC	P	B
DATA SERVICES		.11	.10	.10	100	100	.10	S	I	P	B
DATASTREAM		3.50	2.00	2.00	100	100	2.00	M	L	C	C
DATA TRANSFER		.85	.75	.75	100	100	.75	S	SH	O	R

UK COMPUTER BUREAU REVENUES - IBM SECTOR

SALES COMPANY		ESTIMATED SALES 1979 £'m									
		TOTAL SALES	TOTAL BUREAU SALES	TOTAL BUREAU IBM ONLY	IBM SHARE %	EXTERNAL SALES %	IBM £'m	SIZE	AREA	OWNERSHIP	TYPE
DELTA		.25	.20	.20	100	100	.20	S	L	P	R
DENCO		.10	.20	.20	100	100	.20	S	W	O	B
DONOVAN		.40	.30	.30	100	100	.30	S	L	P	B
EASTERN C.S.		1.00	.64	.64	100	80	.51	S	A	C	B
EJV DATA SERVICES		.30	.25	.25	100	65	.16	S	L	C	B
EXTEL		1.50	1.00	1.00	100	90	.90	M	L	O	B
FOSSE		.20	.18	.18	100	100	.18	S	M	P	B
GEC MIDLAND		11.30	8.50	7.50	10	35	2.6	L	M	C	C
GMS COMPUTING		1.20	.91	.60	66	30	.18	S	N	C	B
GOR RAY		.22	.15	.12	80	100	.12	S	NH	C	B
GRIP		6.20	4.00	4.00	100	15	.60	M	NH	C	R
GROVE		.90	.80	.80	100	100	.80	M	L	O	B
HADRIAN		.68	.25	.10	40	40	.04	S	N	C	B
HALLMARK		.17	.10	.08	80	40	.03	S	SH	C	B
HOSKYNES		12.00	5.30	1.80	34	90	1.62	L	L	O	B
IBM		15.00	15.00	15.00	100	30	4.50	L	L	O	R

UK COMPUTER BUREAU REVENUES - IBM SECTOR

SALES COMPANY	ESTIMATED SALES 1979 £'m									
	TOTAL SALES	TOTAL BUREAU SALES	TOTAL BUREAU IBM ONLY	IBM SHARE %	EXTERNAL SALES %	IBM £'m	SIZE	AREA	OWNERSHIP	TYPE
JASERVE	2.00	1.30	1.30	100	60	.78	M	S	O	B
JBS	.07	.02	.02	100	100	.02	S	M	O	B
KERR	1.00	.80	.80	100	100	.80	M	SC	O	B
LAING	2.90	1.80	1.80	100	40	.72	M	NH	C	B
LOWNDES-AJAX	4.00	3.00	3.00	100	100	3.00	M	SH	O	B
MANIF	.45	.25	.25	10	20	.05	S	W	C	B
McCONNELLS	.10	.08	.08	100	50	.04	S	I	C	B
MPL	.50	.30	.30	100	100	.30	S	W	O	B
DOUGLAS MOORE	2.50	1.55	.20	13	100	.20	M	L	O	B
NDPS	50.00	50.00	2.25	8	8	.34	S	L	C	C
ORWELL	.23	.17	.17	100	30	.05	S	A	O	B

UK COMPUTER BUREAU REVENUES - IBM SECTOR

COMPANY SALES	ESTIMATED SALES 1979 £'m									
	TOTAL SALES	TOTAL BUREAU SALES	TOTAL BUREAU IBM ONLY	IBM SHARE %	EXTERNAL SALES %	IBM £'m	SIZE	AREA	OWNERSHIP	TYPE
OSPREY	.22	.05	.05	100	100	.05	S	S	O	B
RHM COMPUTING	5.90	3.30	3.30	100	50	1.65	M	NH	C	R
ROSS	.50	.45	.45	100	50	.23	S	W	C	B
RTZ	1.20	.90	.80	89	60	.48	M	W	C	C
SCHRODER	1.80	1.00	1.00	100	80	.80	M	W	C	R
IP SHARP	1.50	.80	.80	100	100	.80	M	L	O	R
SOUTHWARK	.90	.60	.40	67	20	.08	S	L	C	C
STAR	.70	.30	.30	100	100	.30	S	L	O	B
STUDLEY	.10	.05	.05	100	100	.05	S	M	O	B
SUN ALLIANCE	5.00	3.00	3.00	100	15	.45	S	M	C	B
SYS CONSULTANTS	1.00	.80	.80	100	100	.80	M	SC	O	R
TARGET	.70	.35	.25	71	100	.25	S	L	O	B
TEAMCO	1.00	1.00	1.00	100	100	1.00	S	L	O	R

UK COMPUTER BUREAU REVENUES - IBM SECTOR

SALES COMPANY		ESTIMATED SALES 1979 £'m								TYPE	
		TOTAL SALES	TOTAL BUREAU SALES	TOTAL BUREAU IBM ONLY	IBM SHARE %	EXTERNAL SALES %	IBM £'m	SIZE	AREA	OWNERSHIP	
TEL FORD THI TYLIN UCSL WELLORAX XCALIBUR		.26	.16	.16	100	100	.16	S	W	O	B
		.90	.40	.40	100	40	.16	S	SH	C	B
		1.90	1.00	1.00	100	40	.40	S	L	C	B
		13.00	8.00	7.55	100	40	3.02	L	L	C	C
		.70	.30	.30	100	100	.30	S	L	O	B
		.75	.60	.60	100	75	.45	S	L	C	B
TOTALS INCLUDING MIXED IBM/ICL BUREAU		249.09	172.74	105.3	68	-	54.06				
DEDUCT MAIN ICL BUREAUX Boeing Hadrian Doug M. ND PS		2.70 .68 2.5 50.0	1.60 .25 1.55 50.00	.30 .10 .20 2.25			.30 .04 .20 .34				
TOTALS EXCLUDING MAIN ICL BUREAUX		193.21	124.34	102.45			53.18				

APPENDIX - C

CAMP INDUSTRY INDEX

COMPANY NAME	INDUSTRY MARKETS											
	MANUFACTURING	TRANSPORTATION	UTILITIES	DISTRIBUTION	BANKING/FINANCE	INSURANCE	MEDICAL/HOSPITAL	EDUCATION	GOVERNMENT	OTHER	DIRECTORY	HIGHLIGHTS
AGB COMPUTER										*	o	
AMBA SOFTWARE											o	
ANGLIA DATA (UCSL)	*				*						o	o
ASTRAL COMPUTER					*	*					o	
AUTOMATION SERVICES	*				*						o	
BARBICAN COMPUTER					*						o	
BLUE CIRCLE		*								*	o	
BOC DATASOLVE					*					*	o	o
BOEING COMPUTER	*				*						o	o
G.H. BROWNBILL					*						o	
BURY COMPUTER				*	*						o	
CARA					*						o	
CDC DATA SERVICES				*	*						o	o
C.E.G.B. COMPUTING										*	o	
CENTREFILE					*					*	o	o
COMPOWER	*	*	*	*	*	*	*	*	*		o	o
COMPUTIME LTD	*										o	
CRL BUREAU											o	
CSS INTERNATIONAL										*	o	
DATA COMPUTING											o	
DATA PUNCH					*					*	o	
DATA SERVICES	*										o	
DATASTREAM					*						o	
DATA TRANSFER											o	
DENCO (HOLDINGS)	*				*						o	
DONOVAN DATA				*							o	
EASTERN COMPUTER (GEEST)				*						*	o	o
EJV DATA										*	o	
EXTEL COMPUTING					*					*	o	

COMPANY NAME	INDUSTRY MARKETS											
	MANUFACTURING	TRANSPORTATION	UTILITIES	DISTRIBUTION	BANKING/FINANCE	INSURANCE	MEDICAL/HOSPITAL	EDUCATION	GOVERNMENT	OTHER	DIRECTORY	HIGHLIGHTS
FOSSE COMPUTER				*							o	
GEC-MIDLAND			*								o	
GMS COMPUTING					*					*	o	
GOR-RAY					*						o	
GRANDMET INFORMATION										*	o	
GROVE COMPUTER											o	
HADRIAN COMPUTER				*						*	o	
HOSKYNs GROUP	*	*		*	*			*		*	o	o
IBM DATA	*	*	*	*	*	*	*	*	*	*	o	o
JASERVE				*							o	
JBS COMPUTER											o	
KERR COMPUTER	*			*							o	
LAING COMPUTING											o	
LOWNDES AJAX	*				*	*					o	o
MANX COMPUTER										*	o	
McCONNELLS SOFTWARE	*										o	
DOUGLAS MOORE											o	
MPL COMPUTERS				*	*					*	o	
NDPS	*	*		*	*	*	*	*			o	
ORWELL DATA		*									o	
OSPREY COMPUTER											o	
RHM COMPUTING				*	*					*	o	
ROSS COMPUTER										*	o	
RTZ COMPUTER											o	
SCHRODER					*					*	o	
I.P. SHARP					*						o	
SOUTHWARK COMPUTER					*	*			*	*	o	
STAR COMPUTER	*	*	*	*	*	*	*	*	*	*	o	
STUDLEY COMPUTER	*										o	

INPUT

APPENDIX - D

CAMP APPLICATIONS INDEX

COMPANY NAME	APPLICATIONS MARKET						
	GENERAL BUSINESS	SCIENTIFIC/ENGINEERING	SPECIALITY	UTILITY	OTHER	DIRECTORY	HIGHLIGHTS
AGB COMPUTER			*			o	
AMBA SOFTWARE					*	o	
ANGLIA DATA (UCSL)	*		*			o	o
ASTRAL COMPUTER	*		*			o	
AUTOMATION SERVICES	*					o	
BARBICAN COMPUTER	*					o	
BLUE CIRCLE		*	*			o	
BOC DATASOLVE	*	*				o	o
BOEING COMPUTER	*		*			o	o
G.H. BROWNBILL	*					o	
BURY COMPUTER	*					o	
CARA	*	*			*	o	
CDC DATA SERVICES	*	*			*	o	o
CENTREFILE	*	*	*			o	o
COMPOWER	*					o	o
COMPUTIME LTD	*					o	
CRL BUREAU	*					o	
CSS INTERNATIONAL		*	*			o	
CYPHER COMPUTERS	*					o	
DATA COMPUTING						o	
DATA-LINK	*		*			o	
DATA PUNCH	*		*			o	
DATA SERVICES	*					o	
DATASTREAM			*			o	
DATA TRANSFER			*			o	
DELTA COMPUTER	*					o	
DENCO (HOLDINGS)	*		*		*	o	
DONOVAN DATA	*		*			o	
EASTERN COMPUTER (GEEST)	*	*	*			o	o

<div> <div>COMPANY NAME</div> <div>APPLICATIONS MARKET</div> </div>	GENERAL BUSINESS	SCIENTIFIC/ENGINEERING	SPECIALITY	UTILITY	OTHER	DIRECTORY	HIGHLIGHTS
EJV DATA			*			o	
EXTEL COMPUTING	*		*			o	
FOSSE COMPUTER	*					o	
GEC-MIDLAND	*	*	*			o	
GMS COMPUTING	*		*			o	
GOR-RAY	*		*			o	
GRANDMET INFORMATION	*		*			o	
GROVE COMPUTER	*					o	
HALLMARK	*		*		*	o	
HOSKYNs GROUP	*		*			o	o
IBM DATA	*	*	*	*	*	o	o
JASERVE	*					o	
JBS COMPUTER	*					o	
KERR COMPUTER	*		*			o	
LAING COMPUTING	*					o	
LOWNDES AJAX	*		*			o	o
MANIF SERVICES	*		*			o	
McCONNELLS SOFTWARE	*					o	
DOUGLAS MOORE	*					o	
MPL COMPUTERS	*		*			o	
NATIONAL DATA P.S.	*	*				o	
ORWELL DATA	*		*			o	
OSPREY COMPUTER	*					o	
RHM COMPUTING	*					o	
ROSS COMPUTER						o	
RTZ COMPUTER	*					o	
SCHRODER			*			o	
I.P. SHARP	*					o	
SOUTHWARK COMPUTER	*					o	

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